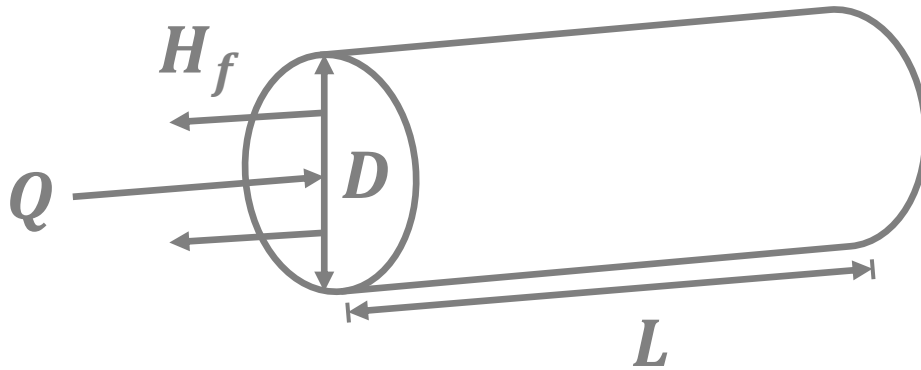


Flow of Water in Pipes



$$H_f = \frac{10.44 * L_{\text{feet}} * Q_{\text{gpm}}^{1.85}}{C^{1.85} * D_{\text{inches}}^{4.8655}}$$

Based on Hazen-Williams
Equation

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PREFACE

This booklet contains data tables for full flow in pipes in English Units, and was prepared using the Hazen-Williams Equation, standard hydraulic equations, conversions, and constants:

- $H_f \text{ (feet)} = \frac{10.44 * L_{\text{feet}} * Q_{\text{gpm}}^{1.85}}{C^{1.85} * D_{\text{inches}}^{4.8655}}$
- $V \left(\frac{\text{feet}}{\text{second}} \right) = \frac{Q}{A} = \frac{0.0022 * Q_{\text{gpm}}}{\pi * \frac{D_{\text{feet}}^2}{4}}$
- $V_{\text{head}} \text{ (feet)} = \frac{V^2}{2 * g}$
- 1 MGD = 694 GPM
- 1 MGD = 1.55 CFS
- 1 GPM = .0022 CFS
- 1 CFS = 449 GPM
- $g = 32.2 \frac{\text{ft}}{\text{s}^2}$

This booklet is organized to quickly determine flow and headloss conditions for specific pipeline diameters. Major sections are presented for flow: Gallons per Minute (GPM), Million Gallons per Day (MGD), and Cubic Feet per Second (CFS) respectively. A range of standard C values were used for calculations of headloss over a reasonable range of velocities and flows. For all data sheets, headloss is presented by number of feet lost per 1,000 feet.



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GPM

Flow of Water in Pipes

0.25 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.65	0.01	37.8	25.0	17.8	15.4	13.4
0.2	1.31	0.03	136	90.1	64.3	55.5	48.4
0.3	1.96	0.06	288	191	136	117	102
0.4	2.61	0.11	491	325	232	200	174
0.5	3.27	0.17	742	491	350	302	264
0.6	3.92	0.24	1,040	688	491	423	369
0.7	4.58	0.33	1,380	915	653	563	491
0.8	5.23	0.43	1,770	1,170	836	721	629
0.9	5.88	0.54	2,200	1,460	1,040	897	782
1	6.54	0.67	2,670	1,770	1,260	1,090	950
1.1	7.19	0.80	3,190	2,110	1,510	1,300	1,130
1.2	7.84	0.96	3,750	2,480	1,770	1,530	1,330
1.3	8.50	1.12	4,350	2,880	2,050	1,770	1,540
1.4	9.15	1.30	4,980	3,300	2,350	2,030	1,770
1.5	9.80	1.49	5,660	3,750	2,670	2,310	2,010
1.6	10.50	1.71	6,380	4,220	3,010	2,600	2,270
1.7	11.10	1.91	7,140	4,720	3,370	2,910	2,540
1.8	11.80	2.16	7,940	5,250	3,750	3,230	2,820
1.9	12.40	2.39	8,770	5,800	4,140	3,570	3,110
2	13.10	2.67	9,640	6,380	4,550	3,930	3,420
2.1	13.70	2.92	10,600	6,980	4,980	4,300	3,750
2.2	14.40	3.22	11,500	7,610	5,430	4,690	4,080
2.3	15.00	3.50	12,500	8,260	5,900	5,090	4,430
2.4	15.70	3.83	13,500	8,940	6,380	5,500	4,800
2.5	16.30	4.13	14,600	9,640	6,880	5,930	5,170
2.6	17.00	4.49	15,700	10,400	7,400	6,380	5,560
2.7	17.60	4.81	16,800	11,100	7,940	6,840	5,970
2.8	18.30	5.21	18,000	11,900	8,490	7,320	6,380
2.9	19.00	5.61	19,200	12,700	9,060	7,810	6,810
3	19.60	5.97	20,400	13,500	9,640	8,320	7,250
3.1	20.30	6.40	21,700	14,400	10,200	8,840	7,700
3.2	20.90	6.79	23,000	15,200	10,900	9,370	8,170
3.3	21.60	7.25	24,400	16,100	11,500	9,920	8,650
3.4	22.20	7.66	25,700	17,000	12,200	10,500	9,140
3.5	22.90	8.15	27,200	18,000	12,800	11,100	9,640
3.6	23.50	8.58	28,600	18,900	13,500	11,700	10,200
3.7	24.20	9.10	30,100	19,900	14,200	12,300	10,700
3.8	24.80	9.56	31,600	20,900	14,900	12,900	11,200
3.9	25.50	10.10	33,200	22,000	15,700	13,500	11,800
4	26.10	10.60	34,800	23,000	16,400	14,200	12,300
4.1	26.80	11.20	36,400	24,100	17,200	14,800	12,900
4.2	27.50	11.80	38,000	25,200	18,000	15,500	13,500
4.3	28.10	12.30	39,700	26,300	18,800	16,200	14,100
4.4	28.80	12.90	41,500	27,400	19,600	16,900	14,700
4.5	29.40	13.40	43,200	28,600	20,400	17,600	15,400
4.6	30.10	14.10	45,000	29,800	21,300	18,300	16,000
4.7	30.70	14.60	46,800	31,000	22,100	19,100	16,600
4.8	31.40	15.30	48,700	32,200	23,000	19,800	17,300
4.9	32.00	15.90	50,600	33,500	23,900	20,600	18,000
5	32.70	16.60	52,500	34,800	24,800	21,400	18,700



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Flow of Water in Pipes

0.375 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.29	0.00	5.25	3.48	2.48	2.14	1.87
0.2	0.58	0.01	18.9	12.5	8.95	7.72	6.73
0.3	0.87	0.01	40.1	26.5	18.9	16.3	14.2
0.4	1.16	0.02	68.3	45.2	32.3	27.8	24.3
0.5	1.45	0.03	103	68.3	48.7	42.0	36.6
0.6	1.74	0.05	145	95.7	68.3	58.9	51.3
0.7	2.03	0.06	192	127	90.8	78.3	68.3
0.8	2.32	0.08	246	163	116	100.	87.4
0.9	2.61	0.11	306	203	145	125	109
1	2.90	0.13	372	246	176	152	132
1.1	3.20	0.16	444	294	210	181	158
1.2	3.49	0.19	521	345	246	212	185
1.3	3.78	0.22	604	400	285	246	215
1.4	4.07	0.26	693	459	327	282	246
1.5	4.36	0.30	788	521	372	321	280
1.6	4.65	0.34	887	587	419	361	315
1.7	4.94	0.38	993	657	469	404	353
1.8	5.23	0.43	1,100	730	521	449	392
1.9	5.52	0.47	1,220	807	576	497	433
2	5.81	0.53	1,340	887	633	546	476
2.1	6.10	0.58	1,470	971	693	598	521
2.2	6.39	0.64	1,600	1,060	756	652	568
2.3	6.68	0.69	1,740	1,150	820	707	617
2.4	6.97	0.76	1,880	1,240	887	765	667
2.5	7.26	0.82	2,030	1,340	957	825	720
2.6	7.55	0.89	2,180	1,440	1,030	887	774
2.7	7.84	0.96	2,340	1,550	1,100	952	830
2.8	8.13	1.03	2,500	1,650	1,180	1,020	887
2.9	8.42	1.10	2,670	1,760	1,260	1,090	947
3	8.71	1.18	2,840	1,880	1,340	1,160	1,010
3.1	9.01	1.26	3,020	2,000	1,420	1,230	1,070
3.2	9.30	1.34	3,200	2,120	1,510	1,300	1,140
3.3	9.59	1.43	3,390	2,240	1,600	1,380	1,200
3.4	9.88	1.52	3,580	2,370	1,690	1,460	1,270
3.5	10.20	1.62	3,780	2,500	1,780	1,540	1,340
3.6	10.50	1.71	3,980	2,630	1,880	1,620	1,410
3.7	10.70	1.78	4,190	2,770	1,980	1,700	1,490
3.8	11.00	1.88	4,400	2,910	2,080	1,790	1,560
3.9	11.30	1.98	4,610	3,050	2,180	1,880	1,640
4	11.60	2.09	4,830	3,200	2,280	1,970	1,720
4.1	11.90	2.20	5,060	3,350	2,390	2,060	1,800
4.2	12.20	2.31	5,290	3,500	2,500	2,160	1,880
4.3	12.50	2.43	5,530	3,660	2,610	2,250	1,960
4.4	12.80	2.55	5,770	3,820	2,720	2,350	2,050
4.5	13.10	2.67	6,010	3,980	2,840	2,450	2,130
4.6	13.40	2.79	6,260	4,140	2,960	2,550	2,220
4.7	13.70	2.92	6,520	4,310	3,080	2,650	2,310
4.8	13.90	3.00	6,770	4,480	3,200	2,760	2,410
4.9	14.20	3.13	7,040	4,660	3,320	2,870	2,500
5	14.50	3.27	7,310	4,830	3,450	2,980	2,590



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Flow of Water in Pipes

0.5 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.33	0.00	4.67	3.09	2.21	1.90	1.66
0.4	0.65	0.01	16.8	11.1	7.96	6.86	5.98
0.6	0.98	0.01	35.7	23.6	16.8	14.5	12.7
0.8	1.31	0.03	60.7	40.2	28.7	24.7	21.6
1	1.63	0.04	91.8	60.7	43.3	37.4	32.6
1.2	1.96	0.06	129	85.1	60.7	52.4	45.7
1.4	2.29	0.08	171	113	80.8	69.6	60.7
1.6	2.61	0.11	219	145	103	89.2	77.7
1.8	2.94	0.13	272	180	129	111	96.7
2	3.27	0.17	331	219	156	135	117
2.2	3.59	0.20	395	261	186	161	140
2.4	3.92	0.24	463	307	219	189	165
2.6	4.25	0.28	537	356	254	219	191
2.8	4.58	0.33	616	408	291	251	219
3	4.90	0.37	700	463	331	285	249
3.2	5.23	0.43	789	522	373	321	280
3.4	5.56	0.48	883	584	417	360	314
3.6	5.88	0.54	981	649	463	400	348
3.8	6.21	0.60	1,080	718	512	442	385
4	6.54	0.67	1,190	789	563	486	423
4.2	6.86	0.73	1,310	864	616	532	463
4.4	7.19	0.80	1,420	941	672	579	505
4.6	7.52	0.88	1,540	1,020	729	629	548
4.8	7.84	0.96	1,670	1,110	789	681	593
5	8.17	1.04	1,800	1,190	851	734	640
5.2	8.50	1.12	1,940	1,280	915	789	688
5.4	8.82	1.21	2,080	1,370	981	846	738
5.6	9.15	1.30	2,220	1,470	1,050	905	789
5.8	9.48	1.40	2,370	1,570	1,120	966	842
6	9.80	1.49	2,520	1,670	1,190	1,030	897
6.2	10.10	1.59	2,680	1,780	1,270	1,090	953
6.4	10.50	1.71	2,840	1,880	1,340	1,160	1,010
6.6	10.80	1.81	3,010	1,990	1,420	1,230	1,070
6.8	11.10	1.91	3,180	2,110	1,500	1,300	1,130
7	11.40	2.02	3,360	2,220	1,590	1,370	1,190
7.2	11.80	2.16	3,540	2,340	1,670	1,440	1,260
7.4	12.10	2.28	3,720	2,460	1,760	1,520	1,320
7.6	12.40	2.39	3,910	2,590	1,850	1,590	1,390
7.8	12.70	2.51	4,100	2,710	1,940	1,670	1,460
8	13.10	2.67	4,300	2,840	2,030	1,750	1,530
8.2	13.40	2.79	4,500	2,980	2,130	1,830	1,600
8.4	13.70	2.92	4,710	3,110	2,220	1,920	1,670
8.6	14.10	3.09	4,910	3,250	2,320	2,000	1,750
8.8	14.40	3.22	5,130	3,390	2,420	2,090	1,820
9	14.70	3.36	5,350	3,540	2,520	2,180	1,900
9.2	15.00	3.50	5,570	3,680	2,630	2,270	1,980
9.4	15.40	3.69	5,790	3,830	2,740	2,360	2,060
9.6	15.70	3.83	6,020	3,990	2,840	2,450	2,140
9.8	16.00	3.98	6,260	4,140	2,960	2,550	2,220
10	16.30	4.13	6,500	4,300	3,070	2,650	2,310



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Flow of Water in Pipes

0.75 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.36	0.00	3.54	2.34	1.67	1.44	1.26
1	0.73	0.01	12.8	8.44	6.03	5.20	4.53
1.5	1.09	0.02	27.0	17.9	12.8	11.0	9.59
2	1.45	0.03	46.0	30.4	21.7	18.7	16.3
2.5	1.82	0.05	69.5	46.0	32.8	28.3	24.7
3	2.18	0.07	97.4	64.5	46.0	39.7	34.6
3.5	2.54	0.10	130	85.7	61.2	52.8	46.0
4	2.90	0.13	166	110	78.3	67.5	58.9
4.5	3.27	0.17	206	136	97.4	84.0	73.2
5	3.63	0.21	251	166	118	102	89.0
5.5	3.99	0.25	299	198	141	122	106
6	4.36	0.30	351	232	166	143	125
6.5	4.72	0.35	407	269	192	166	145
7	5.08	0.40	467	309	221	190	166
7.5	5.45	0.46	531	351	251	216	188
8	5.81	0.53	598	396	282	244	212
8.5	6.17	0.59	669	443	316	272	238
9	6.54	0.67	743	492	351	303	264
9.5	6.90	0.74	822	544	388	335	292
10	7.26	0.82	903	598	427	368	321
10.5	7.63	0.91	989	654	467	403	351
11	7.99	0.99	1,080	713	509	439	383
11.5	8.35	1.08	1,170	774	553	477	415
12	8.71	1.18	1,270	838	598	516	450
12.5	9.08	1.28	1,370	903	645	556	485
13	9.44	1.39	1,470	971	693	598	521
13.5	9.80	1.49	1,570	1,040	743	641	559
14	10.20	1.62	1,680	1,110	795	686	598
14.5	10.50	1.71	1,800	1,190	848	732	638
15	10.90	1.85	1,910	1,270	903	779	679
15.5	11.30	1.98	2,030	1,340	960	828	722
16	11.60	2.09	2,160	1,430	1,020	878	765
16.5	12.00	2.24	2,280	1,510	1,080	929	810
17	12.30	2.35	2,410	1,600	1,140	982	856
17.5	12.70	2.51	2,540	1,680	1,200	1,040	903
18	13.10	2.67	2,680	1,770	1,270	1,090	952
18.5	13.40	2.79	2,820	1,870	1,330	1,150	1,000
19	13.80	2.96	2,960	1,960	1,400	1,210	1,050
19.5	14.20	3.13	3,110	2,060	1,470	1,270	1,100
20	14.50	3.27	3,260	2,160	1,540	1,330	1,160
20.5	14.90	3.45	3,410	2,260	1,610	1,390	1,210
21	15.30	3.64	3,560	2,360	1,680	1,450	1,270
21.5	15.60	3.78	3,720	2,460	1,760	1,520	1,320
22	16.00	3.98	3,880	2,570	1,830	1,580	1,380
22.5	16.30	4.13	4,050	2,680	1,910	1,650	1,440
23	16.70	4.33	4,220	2,790	1,990	1,720	1,500
23.5	17.10	4.54	4,390	2,900	2,070	1,790	1,560
24	17.40	4.71	4,560	3,020	2,160	1,860	1,620
24.5	17.80	4.92	4,740	3,140	2,240	1,930	1,680
25	18.20	5.15	4,920	3,260	2,320	2,000	1,750



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Flow of Water in Pipes

1 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.20	0.00	0.87	0.58	0.41	0.36	0.31
1	0.41	0.00	3.15	2.08	1.49	1.28	1.12
1.5	0.61	0.01	6.66	4.41	3.15	2.71	2.37
2	0.82	0.01	11.3	7.51	5.36	4.62	4.03
2.5	1.02	0.02	17.1	11.3	8.10	6.98	6.09
3	1.23	0.02	24.0	15.9	11.3	9.79	8.53
3.5	1.43	0.03	32.0	21.1	15.1	13.0	11.3
4	1.63	0.04	40.9	27.1	19.3	16.7	14.5
4.5	1.84	0.05	50.9	33.7	24.0	20.7	18.1
5	2.04	0.06	61.8	40.9	29.2	25.2	22.0
5.5	2.25	0.08	73.7	48.8	34.8	30.0	26.2
6	2.45	0.09	86.6	57.3	40.9	35.3	30.8
6.5	2.66	0.11	100.	66.5	47.4	40.9	35.7
7	2.86	0.13	115	76.2	54.4	46.9	40.9
7.5	3.06	0.15	131	86.6	61.8	53.3	46.5
8	3.27	0.17	147	97.6	69.7	60.1	52.4
8.5	3.47	0.19	165	109	77.9	67.2	58.6
9	3.68	0.21	183	121	86.6	74.7	65.1
9.5	3.88	0.23	203	134	95.7	82.5	72.0
10	4.08	0.26	223	147	105	90.8	79.1
10.5	4.29	0.29	244	161	115	99.3	86.6
11	4.49	0.31	266	176	126	108	94.4
11.5	4.70	0.34	289	191	136	118	102
12	4.90	0.37	312	207	147	127	111
12.5	5.11	0.41	337	223	159	137	120
13	5.31	0.44	362	240	171	147	129
13.5	5.51	0.47	388	257	183	158	138
14	5.72	0.51	415	275	196	169	147
14.5	5.92	0.55	443	293	209	180	157
15	6.13	0.58	472	312	223	192	168
15.5	6.33	0.62	501	332	237	204	178
16	6.54	0.67	532	352	251	217	189
16.5	6.74	0.71	563	372	266	229	200
17	6.94	0.75	595	394	281	242	211
17.5	7.15	0.80	627	415	296	256	223
18	7.35	0.84	661	437	312	269	235
18.5	7.56	0.89	695	460	328	283	247
19	7.76	0.94	731	483	345	298	259
19.5	7.97	0.99	767	507	362	312	272
20	8.17	1.04	803	532	379	327	285
20.5	8.37	1.09	841	556	397	342	299
21	8.58	1.14	879	582	415	358	312
21.5	8.78	1.20	918	608	434	374	326
22	8.99	1.26	958	634	453	390	340
22.5	9.19	1.31	999	661	472	407	355
23	9.40	1.37	1,040	688	491	424	369
23.5	9.60	1.43	1,080	716	511	441	384
24	9.80	1.49	1,130	745	532	458	400
24.5	10.00	1.55	1,170	774	552	476	415
25	10.20	1.62	1,210	803	573	494	431



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1666 N. Main Ave., Suite C
Durango, CO 81301
(970) 259-7411

Flow of Water in Pipes

1.25 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1	0.26	0.00	1.06	0.70	0.50	0.43	0.38
2	0.52	0.00	3.83	2.54	1.81	1.56	1.36
3	0.78	0.01	8.11	5.37	3.83	3.30	2.88
4	1.05	0.02	13.8	9.14	6.52	5.63	4.91
5	1.31	0.03	20.9	13.8	9.86	8.50	7.41
6	1.57	0.04	29.2	19.4	13.8	11.9	10.4
7	1.83	0.05	38.9	25.7	18.4	15.8	13.8
8	2.09	0.07	49.8	33.0	23.5	20.3	17.7
9	2.35	0.09	61.9	41.0	29.2	25.2	22.0
10	2.61	0.11	75.2	49.8	35.5	30.6	26.7
11	2.88	0.13	89.8	59.4	42.4	36.6	31.9
12	3.14	0.15	105	69.8	49.8	42.9	37.4
13	3.40	0.18	122	80.9	57.7	49.8	43.4
14	3.66	0.21	140	92.8	66.2	57.1	49.8
15	3.92	0.24	159	105	75.2	64.9	56.6
16	4.18	0.27	180	119	84.8	73.1	63.7
17	4.44	0.31	201	133	94.8	81.8	71.3
18	4.71	0.35	223	148	105	90.9	79.3
19	4.97	0.38	247	163	117	100.	87.6
20	5.23	0.43	271	180	128	110	96.3
21	5.49	0.47	297	196	140	121	105
22	5.75	0.51	324	214	153	132	115
23	6.01	0.56	351	232	166	143	125
24	6.27	0.61	380	252	180	155	135
25	6.54	0.67	410	271	194	167	146
26	6.80	0.72	441	292	208	180	157
27	7.06	0.78	473	313	223	192	168
28	7.32	0.83	505	335	239	206	180
29	7.58	0.89	539	357	255	220	192
30	7.84	0.96	574	380	271	234	204
31	8.10	1.02	610	404	288	249	217
32	8.37	1.09	647	428	306	264	230
33	8.63	1.16	685	453	324	279	243
34	8.89	1.23	724	479	342	295	257
35	9.15	1.30	764	505	361	311	271
36	9.41	1.38	805	533	380	328	286
37	9.67	1.45	847	560	400	345	301
38	9.93	1.53	889	589	420	362	316
39	10.20	1.62	933	618	441	380	331
40	10.50	1.71	978	647	462	398	347
41	10.70	1.78	1,020	677	483	417	363
42	11.00	1.88	1,070	708	505	436	380
43	11.20	1.95	1,120	740	528	455	397
44	11.50	2.06	1,170	772	551	475	414
45	11.80	2.16	1,220	805	574	495	432
46	12.00	2.24	1,270	838	598	516	450
47	12.30	2.35	1,320	872	622	537	468
48	12.50	2.43	1,370	907	647	558	487
49	12.80	2.55	1,420	942	672	580	505
50	13.10	2.67	1,480	978	698	602	525



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Flow of Water in Pipes

1.5 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1	0.18	0.00	0.44	0.29	0.21	0.18	0.16
2	0.36	0.00	1.58	1.04	0.75	0.64	0.56
3	0.55	0.00	3.34	2.21	1.58	1.36	1.19
4	0.73	0.01	5.69	3.76	2.69	2.32	2.02
5	0.91	0.01	8.60	5.69	4.06	3.50	3.05
6	1.09	0.02	12.0	7.97	5.69	4.91	4.28
7	1.27	0.03	16.0	10.6	7.57	6.52	5.69
8	1.45	0.03	20.5	13.6	9.69	8.35	7.28
9	1.63	0.04	25.5	16.9	12.0	10.4	9.06
10	1.82	0.05	31.0	20.5	14.6	12.6	11.0
11	2.00	0.06	37.0	24.5	17.5	15.1	13.1
12	2.18	0.07	43.4	28.7	20.5	17.7	15.4
13	2.36	0.09	50.4	33.3	23.8	20.5	17.9
14	2.54	0.10	57.7	38.2	27.3	23.5	20.5
15	2.72	0.12	65.6	43.4	31.0	26.7	23.3
16	2.90	0.13	73.9	48.9	34.9	30.1	26.3
17	3.09	0.15	82.7	54.7	39.1	33.7	29.4
18	3.27	0.17	91.9	60.8	43.4	37.4	32.6
19	3.45	0.19	102	67.2	48.0	41.4	36.1
20	3.63	0.21	112	73.9	52.8	45.5	39.7
21	3.81	0.23	122	80.9	57.7	49.8	43.4
22	3.99	0.25	133	88.2	62.9	54.3	47.3
23	4.18	0.27	145	95.7	68.3	58.9	51.4
24	4.36	0.30	157	104	73.9	63.8	55.6
25	4.54	0.32	169	112	79.7	68.8	59.9
26	4.72	0.35	182	120	85.7	73.9	64.5
27	4.90	0.37	195	129	91.9	79.3	69.1
28	5.08	0.40	208	138	98.3	84.8	73.9
29	5.27	0.43	222	147	105	90.5	78.9
30	5.45	0.46	237	157	112	96.3	84.0
31	5.63	0.49	251	166	119	102	89.3
32	5.81	0.53	267	176	126	109	94.6
33	5.99	0.56	282	187	133	115	100.
34	6.17	0.59	298	197	141	121	106
35	6.35	0.63	315	208	149	128	112
36	6.54	0.67	331	219	157	135	118
37	6.72	0.70	349	231	165	142	124
38	6.90	0.74	366	242	173	149	130
39	7.08	0.78	384	254	182	157	136
40	7.26	0.82	403	267	190	164	143
41	7.44	0.86	422	279	199	172	150
42	7.63	0.91	441	292	208	180	157
43	7.81	0.95	460	305	217	188	163
44	7.99	0.99	480	318	227	196	171
45	8.17	1.04	501	331	237	204	178
46	8.35	1.08	522	345	246	212	185
47	8.53	1.13	543	359	256	221	193
48	8.71	1.18	564	373	267	230	200
49	8.90	1.23	586	388	277	239	208
50	9.08	1.28	609	403	287	248	216



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Flow of Water in Pipes

2 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.20	0.00	0.39	0.26	0.18	0.16	0.14
4	0.41	0.00	1.40	0.93	0.66	0.57	0.50
6	0.61	0.01	2.97	1.97	1.40	1.21	1.06
8	0.82	0.01	5.06	3.35	2.39	2.06	1.80
10	1.02	0.02	7.64	5.06	3.61	3.11	2.71
12	1.23	0.02	10.7	7.09	5.06	4.36	3.80
14	1.43	0.03	14.2	9.43	6.73	5.80	5.06
16	1.63	0.04	18.2	12.1	8.61	7.43	6.48
18	1.84	0.05	22.7	15.0	10.7	9.24	8.05
20	2.04	0.06	27.6	18.2	13.0	11.2	9.79
22	2.25	0.08	32.9	21.8	15.5	13.4	11.7
24	2.45	0.09	38.6	25.6	18.2	15.7	13.7
26	2.66	0.11	44.8	29.6	21.1	18.2	15.9
28	2.86	0.13	51.4	34.0	24.3	20.9	18.2
30	3.06	0.15	58.3	38.6	27.6	23.8	20.7
32	3.27	0.17	65.7	43.5	31.1	26.8	23.3
34	3.47	0.19	73.5	48.7	34.7	30.0	26.1
36	3.68	0.21	81.7	54.1	38.6	33.3	29.0
38	3.88	0.23	90.3	59.8	42.7	36.8	32.1
40	4.08	0.26	99.3	65.7	46.9	40.5	35.3
42	4.29	0.29	109	72.0	51.4	44.3	38.6
44	4.49	0.31	118	78.4	56.0	48.3	42.1
46	4.70	0.34	129	85.1	60.8	52.4	45.7
48	4.90	0.37	139	92.1	65.7	56.7	49.4
50	5.11	0.41	150	99.3	70.9	61.1	53.3
52	5.31	0.44	161	107	76.2	65.7	57.3
54	5.51	0.47	173	115	81.7	70.5	61.5
56	5.72	0.51	185	123	87.4	75.4	65.7
58	5.92	0.55	198	131	93.3	80.5	70.2
60	6.13	0.58	210	139	99.3	85.7	74.7
62	6.33	0.62	223	148	106	91.0	79.4
64	6.54	0.67	237	157	112	96.5	84.2
66	6.74	0.71	251	166	118	102	89.1
68	6.94	0.75	265	175	125	108	94.2
70	7.15	0.80	280	185	132	114	99.3
72	7.35	0.84	295	195	139	120	105
74	7.56	0.89	310	205	146	126	110
76	7.76	0.94	326	216	154	133	116
78	7.97	0.99	342	226	161	139	121
80	8.17	1.04	358	237	169	146	127
82	8.37	1.09	375	248	177	153	133
84	8.58	1.14	392	259	185	160	139
86	8.78	1.20	409	271	193	167	145
88	8.99	1.26	427	283	202	174	152
90	9.19	1.31	445	295	210	181	158
92	9.40	1.37	464	307	219	189	165
94	9.60	1.43	483	319	228	197	171
96	9.80	1.49	502	332	237	204	178
98	10.00	1.55	521	345	246	212	185
100	10.20	1.62	541	358	256	220	192



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Flow of Water in Pipes

3 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
5	0.23	0.00	0.30	0.20	0.14	0.12	0.11
10	0.45	0.00	1.06	0.70	0.50	0.43	0.38
15	0.68	0.01	2.25	1.49	1.06	0.92	0.80
20	0.91	0.01	3.83	2.54	1.81	1.56	1.36
25	1.13	0.02	5.79	3.83	2.74	2.36	2.06
30	1.36	0.03	8.11	5.37	3.83	3.30	2.88
35	1.59	0.04	10.8	7.14	5.10	4.40	3.83
40	1.82	0.05	13.8	9.14	6.53	5.63	4.91
45	2.04	0.06	17.2	11.4	8.11	7.00	6.10
50	2.27	0.08	20.9	13.8	9.86	8.50	7.41
55	2.50	0.10	24.9	16.5	11.8	10.1	8.84
60	2.72	0.12	29.3	19.4	13.8	11.9	10.4
65	2.95	0.14	33.9	22.4	16.0	13.8	12.0
70	3.18	0.16	38.9	25.7	18.4	15.8	13.8
75	3.40	0.18	44.2	29.3	20.9	18.0	15.7
80	3.63	0.21	49.8	33.0	23.5	20.3	17.7
85	3.86	0.23	55.7	36.9	26.3	22.7	19.8
90	4.08	0.26	61.9	41.0	29.3	25.2	22.0
95	4.31	0.29	68.4	45.3	32.3	27.9	24.3
100	4.54	0.32	75.3	49.8	35.5	30.7	26.7
105	4.77	0.35	82.4	54.5	38.9	33.5	29.3
110	4.99	0.39	89.8	59.4	42.4	36.6	31.9
115	5.22	0.42	97.5	64.5	46.0	39.7	34.6
120	5.45	0.46	105	69.8	49.8	42.9	37.4
125	5.67	0.50	114	75.3	53.7	46.3	40.4
130	5.90	0.54	122	80.9	57.8	49.8	43.4
135	6.13	0.58	131	86.8	61.9	53.4	46.6
140	6.35	0.63	140	92.8	66.2	57.1	49.8
145	6.58	0.67	150	99.0	70.7	61.0	53.1
150	6.81	0.72	159	105	75.3	64.9	56.6
155	7.04	0.77	169	112	80.0	69.0	60.1
160	7.26	0.82	180	119	84.8	73.1	63.8
165	7.49	0.87	190	126	89.8	77.4	67.5
170	7.72	0.93	201	133	94.9	81.8	71.3
175	7.94	0.98	212	140	100.	86.3	75.3
180	8.17	1.04	223	148	105	90.9	79.3
185	8.40	1.10	235	155	111	95.7	83.4
190	8.62	1.15	247	163	117	100.	87.6
195	8.85	1.22	259	171	122	105	91.9
200	9.08	1.28	271	180	128	111	96.3
205	9.30	1.34	284	188	134	116	101
210	9.53	1.41	297	197	140	121	105
215	9.76	1.48	310	205	146	126	110
220	9.99	1.55	324	214	153	132	115
225	10.20	1.62	337	223	159	137	120
230	10.40	1.68	351	233	166	143	125
235	10.70	1.78	366	242	173	149	130
240	10.90	1.85	380	252	180	155	135
245	11.10	1.91	395	261	187	161	140
250	11.30	1.98	410	271	194	167	146



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Flow of Water in Pipes

4 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
10	0.26	0.00	0.26	0.17	0.12	0.11	0.09
20	0.51	0.00	0.95	0.63	0.45	0.39	0.34
30	0.77	0.01	2.00	1.32	0.95	0.82	0.71
40	1.02	0.02	3.41	2.26	1.61	1.39	1.21
50	1.28	0.03	5.15	3.41	2.43	2.10	1.83
60	1.53	0.04	7.22	4.77	3.41	2.94	2.56
70	1.79	0.05	9.60	6.35	4.53	3.91	3.41
80	2.04	0.06	12.3	8.13	5.80	5.00	4.36
90	2.30	0.08	15.3	10.1	7.22	6.22	5.42
100	2.55	0.10	18.6	12.3	8.77	7.56	6.59
110	2.81	0.12	22.1	14.7	10.5	9.02	7.86
120	3.06	0.15	26.0	17.2	12.3	10.6	9.24
130	3.32	0.17	30.2	20.0	14.2	12.3	10.7
140	3.57	0.20	34.6	22.9	16.3	14.1	12.3
150	3.83	0.23	39.3	26.0	18.6	16.0	14.0
160	4.08	0.26	44.3	29.3	20.9	18.0	15.7
170	4.34	0.29	49.5	32.8	23.4	20.2	17.6
180	4.60	0.33	55.1	36.4	26.0	22.4	19.6
190	4.85	0.37	60.9	40.3	28.7	24.8	21.6
200	5.11	0.41	66.9	44.3	31.6	27.3	23.8
210	5.36	0.45	73.2	48.5	34.6	29.8	26.0
220	5.62	0.49	79.8	52.8	37.7	32.5	28.3
230	5.87	0.54	86.7	57.4	40.9	35.3	30.8
240	6.13	0.58	93.8	62.1	44.3	38.2	33.3
250	6.38	0.63	101	66.9	47.8	41.2	35.9
260	6.64	0.69	109	72.0	51.4	44.3	38.6
270	6.89	0.74	117	77.2	55.1	47.5	41.4
280	7.15	0.80	125	82.5	58.9	50.8	44.3
290	7.40	0.85	133	88.1	62.9	54.2	47.3
300	7.66	0.91	142	93.8	66.9	57.7	50.3
310	7.91	0.97	151	99.6	71.1	61.3	53.5
320	8.17	1.04	160	106	75.4	65.0	56.7
330	8.43	1.10	169	112	79.8	68.8	60.0
340	8.68	1.17	179	118	84.4	72.7	63.4
350	8.94	1.24	188	125	89.0	76.8	66.9
360	9.19	1.31	199	131	93.8	80.9	70.5
370	9.45	1.39	209	138	98.6	85.1	74.2
380	9.70	1.46	219	145	104	89.4	77.9
390	9.96	1.54	230	152	109	93.8	81.8
400	10.20	1.62	241	160	114	98.3	85.7
410	10.50	1.71	253	167	119	103	89.7
420	10.70	1.78	264	175	125	108	93.8
430	11.00	1.88	276	183	130	112	97.9
440	11.20	1.95	288	190	136	117	102
450	11.50	2.06	300	199	142	122	107
460	11.70	2.13	312	207	148	127	111
470	12.00	2.24	325	215	154	132	115
480	12.30	2.35	338	224	160	138	120
490	12.50	2.43	351	232	166	143	125
500	12.80	2.55	365	241	172	148	129



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Flow of Water in Pipes

6 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
20	0.23	0.00	0.13	0.09	0.06	0.05	0.05
40	0.45	0.00	0.47	0.31	0.22	0.19	0.17
60	0.68	0.01	1.00	0.66	0.47	0.41	0.36
80	0.91	0.01	1.71	1.13	0.81	0.70	0.61
100	1.13	0.02	2.58	1.71	1.22	1.05	0.92
120	1.36	0.03	3.62	2.39	1.71	1.47	1.28
140	1.59	0.04	4.81	3.18	2.27	1.96	1.71
160	1.82	0.05	6.16	4.08	2.91	2.51	2.19
180	2.04	0.06	7.66	5.07	3.62	3.12	2.72
200	2.27	0.08	9.31	6.16	4.40	3.79	3.31
220	2.50	0.10	11.1	7.35	5.24	4.52	3.94
240	2.72	0.12	13.0	8.63	6.16	5.31	4.63
260	2.95	0.14	15.1	10.	7.14	6.16	5.37
280	3.18	0.16	17.3	11.5	8.19	7.06	6.16
300	3.40	0.18	19.7	13.0	9.31	8.03	7.00
320	3.63	0.21	22.2	14.7	10.5	9.04	7.88
340	3.86	0.23	24.8	16.4	11.7	10.1	8.82
360	4.08	0.26	27.6	18.3	13.0	11.2	9.80
380	4.31	0.29	30.5	20.2	14.4	12.4	10.8
400	4.54	0.32	33.6	22.2	15.8	13.7	11.9
420	4.77	0.35	36.7	24.3	17.3	15.0	13.0
440	4.99	0.39	40.0	26.5	18.9	16.3	14.2
460	5.22	0.42	43.5	28.8	20.5	17.7	15.4
480	5.45	0.46	47.0	31.1	22.2	19.1	16.7
500	5.67	0.50	50.7	33.6	23.9	20.6	18.0
520	5.90	0.54	54.5	36.1	25.7	22.2	19.4
540	6.13	0.58	58.5	38.7	27.6	23.8	20.8
560	6.35	0.63	62.5	41.4	29.5	25.5	22.2
580	6.58	0.67	66.7	44.2	31.5	27.2	23.7
600	6.81	0.72	71.0	47.0	33.6	28.9	25.2
620	7.04	0.77	75.5	49.9	35.6	30.7	26.8
640	7.26	0.82	80.0	53.0	37.8	32.6	28.4
660	7.49	0.87	84.7	56.1	40.0	34.5	30.1
680	7.72	0.93	89.5	59.3	42.3	36.5	31.8
700	7.94	0.98	94.5	62.5	44.6	38.5	33.6
720	8.17	1.04	99.5	65.9	47.0	40.5	35.3
740	8.40	1.10	105	69.3	49.5	42.6	37.2
760	8.62	1.15	110	72.8	52.0	44.8	39.1
780	8.85	1.22	115	76.4	54.5	47.0	41.0
800	9.08	1.28	121	80.0	57.1	49.3	43.0
820	9.30	1.34	127	83.8	59.8	51.6	45.0
840	9.53	1.41	132	87.6	62.5	53.9	47.0
860	9.76	1.48	138	91.5	65.3	56.3	49.1
880	9.99	1.55	144	95.5	68.1	58.8	51.2
900	10.20	1.62	150	99.5	71.0	61.3	53.4
920	10.40	1.68	157	104	74.0	63.8	55.6
940	10.70	1.78	163	108	77.0	66.4	57.9
960	10.90	1.85	169	112	80.0	69.0	60.2
980	11.10	1.91	176	117	83.2	71.7	62.5
1,000	11.30	1.98	183	121	86.3	74.4	64.9



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Flow of Water in Pipes

8 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
50	0.32	0.00	0.18	0.12	0.08	0.07	0.06
100	0.64	0.01	0.64	0.42	0.30	0.26	0.23
150	0.96	0.01	1.35	0.89	0.64	0.55	0.48
200	1.28	0.03	2.30	1.52	1.08	0.94	0.82
250	1.60	0.04	3.47	2.30	1.64	1.41	1.23
300	1.91	0.06	4.86	3.22	2.30	1.98	1.73
350	2.23	0.08	6.46	4.28	3.05	2.63	2.30
400	2.55	0.10	8.28	5.48	3.91	3.37	2.94
450	2.87	0.13	10.3	6.81	4.86	4.19	3.65
500	3.19	0.16	12.5	8.28	5.91	5.09	4.44
550	3.51	0.19	14.9	9.87	7.05	6.08	5.30
600	3.83	0.23	17.5	11.6	8.28	7.14	6.22
650	4.15	0.27	20.3	13.4	9.60	8.28	7.22
700	4.47	0.31	23.3	15.4	11.0	9.49	8.28
750	4.79	0.36	26.5	17.5	12.5	10.8	9.40
800	5.11	0.41	29.8	19.7	14.1	12.2	10.6
850	5.43	0.46	33.4	22.1	15.8	13.6	11.9
900	5.74	0.51	37.1	24.6	17.5	15.1	13.2
950	6.06	0.57	41.0	27.1	19.4	16.7	14.6
1,000	6.38	0.63	45.1	29.8	21.3	18.4	16.0
1,050	6.70	0.70	49.3	32.7	23.3	20.1	17.5
1,100	7.02	0.77	53.8	35.6	25.4	21.9	19.1
1,150	7.34	0.84	58.4	38.6	27.6	23.8	20.7
1,200	7.66	0.91	63.2	41.8	29.8	25.7	22.4
1,250	7.98	0.99	68.1	45.1	32.2	27.7	24.2
1,300	8.30	1.07	73.2	48.5	34.6	29.8	26.0
1,350	8.62	1.15	78.5	52.0	37.1	32.0	27.9
1,400	8.94	1.24	84.0	55.6	39.7	34.2	29.8
1,450	9.25	1.33	89.6	59.3	42.3	36.5	31.8
1,500	9.57	1.42	95.4	63.2	45.1	38.9	33.9
1,550	9.89	1.52	101	67.1	47.9	41.3	36.0
1,600	10.20	1.62	108	71.2	50.8	43.8	38.2
1,650	10.50	1.71	114	75.3	53.8	46.4	40.4
1,700	10.90	1.85	120	79.6	56.8	49.0	42.7
1,750	11.20	1.95	127	84.0	60.0	51.7	45.1
1,800	11.50	2.06	134	88.5	63.2	54.5	47.5
1,850	11.80	2.16	141	93.1	66.5	57.3	50.0
1,900	12.10	2.28	148	97.8	69.8	60.2	52.5
1,950	12.40	2.39	155	103	73.2	63.2	55.1
2,000	12.80	2.55	163	108	76.8	66.2	57.7
2,050	13.10	2.67	170	113	80.3	69.3	60.4
2,100	13.40	2.79	178	118	84.0	72.4	63.2
2,150	13.70	2.92	186	123	87.7	75.7	66.0
2,200	14.00	3.05	194	128	91.6	79.0	68.8
2,250	14.40	3.22	202	134	95.4	82.3	71.8
2,300	14.70	3.36	210	139	99.4	85.7	74.7
2,350	15.00	3.50	219	145	103	89.2	77.8
2,400	15.30	3.64	228	151	108	92.7	80.9
2,450	15.60	3.78	237	157	112	96.4	84.0
2,500	16.00	3.98	246	163	116	100.	87.2



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Flow of Water in Pipes

10 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
50	0.20	0.00	0.06	0.04	0.03	0.02	0.02
100	0.41	0.00	0.22	0.14	0.10	0.09	0.08
150	0.61	0.01	0.46	0.30	0.22	0.19	0.16
200	0.82	0.01	0.78	0.51	0.37	0.32	0.28
250	1.02	0.02	1.17	0.78	0.55	0.48	0.42
300	1.23	0.02	1.64	1.09	0.78	0.67	0.58
350	1.43	0.03	2.18	1.44	1.03	0.89	0.78
400	1.63	0.04	2.79	1.85	1.32	1.14	0.99
450	1.84	0.05	3.47	2.30	1.64	1.42	1.23
500	2.04	0.06	4.22	2.79	1.99	1.72	1.50
550	2.25	0.08	5.04	3.33	2.38	2.05	1.79
600	2.45	0.09	5.92	3.92	2.79	2.41	2.10
650	2.66	0.11	6.86	4.54	3.24	2.79	2.44
700	2.86	0.13	7.87	5.21	3.72	3.21	2.79
750	3.06	0.15	8.94	5.92	4.22	3.64	3.17
800	3.27	0.17	10.1	6.67	4.76	4.10	3.58
850	3.47	0.19	11.3	7.46	5.32	4.59	4.00
900	3.68	0.21	12.5	8.29	5.92	5.10	4.45
950	3.88	0.23	13.8	9.16	6.54	5.64	4.92
1,000	4.08	0.26	15.2	10.1	7.19	6.20	5.41
1,050	4.29	0.29	16.7	11.0	7.87	6.79	5.92
1,100	4.49	0.31	18.2	12.0	8.58	7.40	6.45
1,150	4.70	0.34	19.7	13.0	9.31	8.03	7.00
1,200	4.90	0.37	21.3	14.1	10.1	8.69	7.57
1,250	5.11	0.41	23.0	15.2	10.9	9.37	8.17
1,300	5.31	0.44	24.7	16.4	11.7	10.1	8.78
1,350	5.51	0.47	26.5	17.6	12.5	10.8	9.42
1,400	5.72	0.51	28.4	18.8	13.4	11.6	10.1
1,450	5.92	0.55	30.3	20.0	14.3	12.3	10.7
1,500	6.13	0.58	32.2	21.3	15.2	13.1	11.4
1,550	6.33	0.62	34.2	22.7	16.2	13.9	12.2
1,600	6.54	0.67	36.3	24.0	17.2	14.8	12.9
1,650	6.74	0.71	38.4	25.4	18.2	15.7	13.7
1,700	6.94	0.75	40.6	26.9	19.2	16.5	14.4
1,750	7.15	0.80	42.9	28.4	20.2	17.5	15.2
1,800	7.35	0.84	45.2	29.9	21.3	18.4	16.0
1,850	7.56	0.89	47.5	31.4	22.4	19.3	16.9
1,900	7.76	0.94	49.9	33.0	23.6	20.3	17.7
1,950	7.97	0.99	52.4	34.7	24.7	21.3	18.6
2,000	8.17	1.04	54.9	36.3	25.9	22.4	19.5
2,050	8.37	1.09	57.4	38.0	27.1	23.4	20.4
2,100	8.58	1.14	60.1	39.7	28.4	24.5	21.3
2,150	8.78	1.20	62.7	41.5	29.6	25.6	22.3
2,200	8.99	1.26	65.5	43.3	30.9	26.7	23.2
2,250	9.19	1.31	68.2	45.2	32.2	27.8	24.2
2,300	9.40	1.37	71.1	47.0	33.6	28.9	25.2
2,350	9.60	1.43	74.0	48.9	34.9	30.1	26.3
2,400	9.80	1.49	76.9	50.9	36.3	31.3	27.3
2,450	10.00	1.55	79.9	52.9	37.7	32.5	28.4
2,500	10.20	1.62	82.9	54.9	39.2	33.8	29.4



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Flow of Water in Pipes

12 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
100	0.28	0.00	0.09	0.06	0.04	0.04	0.03
200	0.57	0.01	0.32	0.21	0.15	0.13	0.11
300	0.85	0.01	0.68	0.45	0.32	0.28	0.24
400	1.13	0.02	1.15	0.76	0.54	0.47	0.41
500	1.42	0.03	1.74	1.15	0.82	0.71	0.62
600	1.70	0.04	2.44	1.61	1.15	0.99	0.87
700	1.99	0.06	3.24	2.14	1.53	1.32	1.15
800	2.27	0.08	4.15	2.75	1.96	1.69	1.47
900	2.55	0.10	5.16	3.41	2.44	2.10	1.83
1,000	2.84	0.13	6.27	4.15	2.96	2.55	2.23
1,100	3.12	0.15	7.48	4.95	3.53	3.05	2.66
1,200	3.40	0.18	8.78	5.81	4.15	3.58	3.12
1,300	3.69	0.21	10.2	6.74	4.81	4.15	3.62
1,400	3.97	0.25	11.7	7.73	5.52	4.76	4.15
1,500	4.26	0.28	13.3	8.78	6.27	5.41	4.71
1,600	4.54	0.32	15.0	9.90	7.06	6.09	5.31
1,700	4.82	0.36	16.7	11.1	7.90	6.82	5.94
1,800	5.11	0.41	18.6	12.3	8.78	7.58	6.60
1,900	5.39	0.45	20.6	13.6	9.71	8.37	7.30
2,000	5.67	0.50	22.6	15.0	10.7	9.21	8.03
2,100	5.96	0.55	24.7	16.4	11.7	10.1	8.78
2,200	6.24	0.61	27.0	17.8	12.7	11.0	9.57
2,300	6.52	0.66	29.3	19.4	13.8	11.9	10.4
2,400	6.81	0.72	31.7	21.0	15.0	12.9	11.2
2,500	7.09	0.78	34.2	22.6	16.1	13.9	12.1
2,600	7.38	0.85	36.7	24.3	17.3	15.0	13.0
2,700	7.66	0.91	39.4	26.1	18.6	16.0	14.0
2,800	7.94	0.98	42.1	27.9	19.9	17.2	15.0
2,900	8.23	1.05	44.9	29.7	21.2	18.3	16.0
3,000	8.51	1.13	47.9	31.7	22.6	19.5	17.0
3,100	8.79	1.20	50.8	33.6	24.0	20.7	18.1
3,200	9.08	1.28	53.9	35.7	25.5	22.0	19.1
3,300	9.36	1.36	57.1	37.8	27.0	23.2	20.3
3,400	9.65	1.45	60.3	39.9	28.5	24.6	21.4
3,500	9.93	1.53	63.6	42.1	30.1	25.9	22.6
3,600	10.20	1.62	67.0	44.4	31.7	27.3	23.8
3,700	10.50	1.71	70.5	46.7	33.3	28.7	25.0
3,800	10.80	1.81	74.1	49.0	35.0	30.2	26.3
3,900	11.10	1.91	77.7	51.5	36.7	31.7	27.6
4,000	11.30	1.98	81.5	53.9	38.5	33.2	28.9
4,100	11.60	2.09	85.3	56.4	40.3	34.7	30.3
4,200	11.90	2.20	89.2	59.0	42.1	36.3	31.7
4,300	12.20	2.31	93.1	61.6	44.0	37.9	33.1
4,400	12.50	2.43	97.2	64.3	45.9	39.6	34.5
4,500	12.80	2.55	101	67.0	47.9	41.3	36.0
4,600	13.00	2.63	106	69.8	49.8	43.0	37.5
4,700	13.30	2.75	110	72.7	51.9	44.7	39.0
4,800	13.60	2.87	114	75.6	53.9	46.5	40.5
4,900	13.90	3.00	119	78.5	56.0	48.3	42.1
5,000	14.20	3.13	123	81.5	58.2	50.1	43.7



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Flow of Water in Pipes

14 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
100	0.21	0.00	0.04	0.03	0.02	0.02	0.01
200	0.42	0.00	0.15	0.10	0.07	0.06	0.05
300	0.63	0.01	0.32	0.21	0.15	0.13	0.11
400	0.83	0.01	0.54	0.36	0.26	0.22	0.19
500	1.04	0.02	0.82	0.54	0.39	0.34	0.29
600	1.25	0.02	1.15	0.76	0.54	0.47	0.41
700	1.46	0.03	1.53	1.01	0.72	0.62	0.54
800	1.67	0.04	1.96	1.30	0.93	0.80	0.70
900	1.88	0.05	2.44	1.61	1.15	0.99	0.87
1,000	2.08	0.07	2.96	1.96	1.40	1.21	1.05
1,100	2.29	0.08	3.53	2.34	1.67	1.44	1.25
1,200	2.50	0.10	4.15	2.75	1.96	1.69	1.47
1,300	2.71	0.11	4.81	3.18	2.27	1.96	1.71
1,400	2.92	0.13	5.52	3.65	2.61	2.25	1.96
1,500	3.13	0.15	6.27	4.15	2.96	2.55	2.23
1,600	3.33	0.17	7.07	4.68	3.34	2.88	2.51
1,700	3.54	0.20	7.90	5.23	3.73	3.22	2.81
1,800	3.75	0.22	8.79	5.81	4.15	3.58	3.12
1,900	3.96	0.24	9.71	6.43	4.59	3.95	3.45
2,000	4.17	0.27	10.7	7.07	5.04	4.35	3.79
2,100	4.38	0.30	11.7	7.73	5.52	4.76	4.15
2,200	4.59	0.33	12.7	8.43	6.01	5.19	4.52
2,300	4.79	0.36	13.8	9.15	6.53	5.63	4.91
2,400	5.00	0.39	15.0	9.90	7.07	6.09	5.31
2,500	5.21	0.42	16.1	10.7	7.62	6.57	5.73
2,600	5.42	0.46	17.3	11.5	8.19	7.07	6.16
2,700	5.63	0.49	18.6	12.3	8.79	7.58	6.61
2,800	5.84	0.53	19.9	13.2	9.40	8.10	7.07
2,900	6.04	0.57	21.2	14.0	10.	8.65	7.54
3,000	6.25	0.61	22.6	15.0	10.7	9.21	8.03
3,100	6.46	0.65	24.0	15.9	11.3	9.78	8.53
3,200	6.67	0.69	25.5	16.9	12.0	10.4	9.04
3,300	6.88	0.74	27.0	17.8	12.7	11.0	9.57
3,400	7.09	0.78	28.5	18.9	13.5	11.6	10.1
3,500	7.29	0.83	30.1	19.9	14.2	12.2	10.7
3,600	7.50	0.87	31.7	21.0	15.0	12.9	11.2
3,700	7.71	0.92	33.3	22.0	15.7	13.6	11.8
3,800	7.92	0.98	35.0	23.2	16.5	14.3	12.4
3,900	8.13	1.03	36.7	24.3	17.3	15.0	13.0
4,000	8.34	1.08	38.5	25.5	18.2	15.7	13.7
4,100	8.55	1.14	40.3	26.7	19.0	16.4	14.3
4,200	8.75	1.19	42.1	27.9	19.9	17.2	15.0
4,300	8.96	1.25	44.0	29.1	20.8	17.9	15.6
4,400	9.17	1.31	45.9	30.4	21.7	18.7	16.3
4,500	9.38	1.37	47.9	31.7	22.6	19.5	17.0
4,600	9.59	1.43	49.8	33.0	23.5	20.3	17.7
4,700	9.80	1.49	51.9	34.3	24.5	21.1	18.4
4,800	10.00	1.55	53.9	35.7	25.5	22.0	19.2
4,900	10.20	1.62	56.0	37.1	26.5	22.8	19.9
5,000	10.40	1.68	58.2	38.5	27.5	23.7	20.7



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Flow of Water in Pipes

16 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
200	0.32	0.00	0.08	0.05	0.04	0.03	0.03
400	0.64	0.01	0.28	0.19	0.13	0.12	0.10
600	0.96	0.01	0.60	0.40	0.28	0.25	0.21
800	1.28	0.03	1.02	0.68	0.48	0.42	0.36
1,000	1.60	0.04	1.55	1.02	0.73	0.63	0.55
1,200	1.91	0.06	2.17	1.43	1.02	0.88	0.77
1,400	2.23	0.08	2.88	1.91	1.36	1.17	1.02
1,600	2.55	0.10	3.69	2.44	1.74	1.50	1.31
1,800	2.87	0.13	4.59	3.04	2.17	1.87	1.63
2,000	3.19	0.16	5.57	3.69	2.63	2.27	1.98
2,200	3.51	0.19	6.65	4.40	3.14	2.71	2.36
2,400	3.83	0.23	7.81	5.17	3.69	3.18	2.77
2,600	4.15	0.27	9.06	5.99	4.28	3.69	3.22
2,800	4.47	0.31	10.4	6.88	4.91	4.23	3.69
3,000	4.79	0.36	11.8	7.81	5.57	4.81	4.19
3,200	5.11	0.41	13.3	8.80	6.28	5.42	4.72
3,400	5.43	0.46	14.9	9.85	7.03	6.06	5.28
3,600	5.74	0.51	16.5	10.9	7.81	6.74	5.87
3,800	6.06	0.57	18.3	12.1	8.63	7.44	6.49
4,000	6.38	0.63	20.1	13.3	9.49	8.19	7.14
4,200	6.70	0.70	22.0	14.6	10.4	8.96	7.81
4,400	7.02	0.77	24.0	15.9	11.3	9.76	8.51
4,600	7.34	0.84	26.0	17.2	12.3	10.6	9.24
4,800	7.66	0.91	28.2	18.6	13.3	11.5	10.
5,000	7.98	0.99	30.4	20.1	14.3	12.4	10.8
5,200	8.30	1.07	32.7	21.6	15.4	13.3	11.6
5,400	8.62	1.15	35.0	23.2	16.5	14.3	12.4
5,600	8.94	1.24	37.5	24.8	17.7	15.3	13.3
5,800	9.25	1.33	40.0	26.4	18.9	16.3	14.2
6,000	9.57	1.42	42.6	28.2	20.1	17.3	15.1
6,200	9.89	1.52	45.2	29.9	21.4	18.4	16.1
6,400	10.20	1.62	47.9	31.7	22.6	19.5	17.0
6,600	10.50	1.71	50.8	33.6	24.0	20.7	18.0
6,800	10.90	1.85	53.6	35.5	25.3	21.8	19.0
7,000	11.20	1.95	56.6	37.5	26.7	23.1	20.1
7,200	11.50	2.06	59.6	39.5	28.2	24.3	21.2
7,400	11.80	2.16	62.7	41.5	29.6	25.5	22.3
7,600	12.10	2.28	65.9	43.6	31.1	26.8	23.4
7,800	12.40	2.39	69.1	45.8	32.7	28.2	24.6
8,000	12.80	2.55	72.5	47.9	34.2	29.5	25.7
8,200	13.10	2.67	75.8	50.2	35.8	30.9	26.9
8,400	13.40	2.79	79.3	52.5	37.5	32.3	28.2
8,600	13.70	2.92	82.8	54.8	39.1	33.7	29.4
8,800	14.00	3.05	86.4	57.2	40.8	35.2	30.7
9,000	14.40	3.22	90.1	59.6	42.6	36.7	32.0
9,200	14.70	3.36	93.8	62.1	44.3	38.2	33.3
9,400	15.00	3.50	97.6	64.6	46.1	39.8	34.7
9,600	15.30	3.64	102	67.2	47.9	41.3	36.1
9,800	15.60	3.78	105	69.8	49.8	43.0	37.5
10,000	16.00	3.98	109	72.5	51.7	44.6	38.9



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Flow of Water in Pipes

18 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
200	0.25	0.00	0.04	0.03	0.02	0.02	0.02
400	0.50	0.00	0.16	0.11	0.08	0.07	0.06
600	0.76	0.01	0.34	0.22	0.16	0.14	0.12
800	1.01	0.02	0.58	0.38	0.27	0.24	0.21
1,000	1.26	0.02	0.87	0.58	0.41	0.36	0.31
1,200	1.51	0.04	1.22	0.81	0.58	0.50	0.43
1,400	1.77	0.05	1.62	1.08	0.77	0.66	0.58
1,600	2.02	0.06	2.08	1.38	0.98	0.85	0.74
1,800	2.27	0.08	2.59	1.71	1.22	1.05	0.92
2,000	2.52	0.10	3.14	2.08	1.48	1.28	1.12
2,200	2.77	0.12	3.75	2.48	1.77	1.53	1.33
2,400	3.03	0.14	4.40	2.91	2.08	1.79	1.56
2,600	3.28	0.17	5.11	3.38	2.41	2.08	1.81
2,800	3.53	0.19	5.86	3.88	2.77	2.39	2.08
3,000	3.78	0.22	6.65	4.40	3.14	2.71	2.36
3,200	4.03	0.25	7.50	4.96	3.54	3.05	2.66
3,400	4.29	0.29	8.39	5.55	3.96	3.42	2.98
3,600	4.54	0.32	9.32	6.17	4.40	3.80	3.31
3,800	4.79	0.36	10.3	6.82	4.87	4.20	3.66
4,000	5.04	0.40	11.3	7.50	5.35	4.62	4.02
4,200	5.30	0.44	12.4	8.21	5.86	5.05	4.40
4,400	5.55	0.48	13.5	8.94	6.38	5.51	4.80
4,600	5.80	0.52	14.7	9.71	6.93	5.98	5.21
4,800	6.05	0.57	15.9	10.5	7.50	6.47	5.64
5,000	6.30	0.62	17.1	11.3	8.09	6.97	6.08
5,200	6.56	0.67	18.4	12.2	8.70	7.50	6.54
5,400	6.81	0.72	19.7	13.1	9.32	8.04	7.01
5,600	7.06	0.78	21.1	14.0	9.97	8.60	7.50
5,800	7.31	0.83	22.5	14.9	10.6	9.18	8.00
6,000	7.56	0.89	24.0	15.9	11.3	9.77	8.52
6,200	7.82	0.95	25.5	16.9	12.0	10.4	9.05
6,400	8.07	1.01	27.0	17.9	12.8	11.0	9.60
6,600	8.32	1.08	28.6	18.9	13.5	11.7	10.2
6,800	8.57	1.14	30.2	20.0	14.3	12.3	10.7
7,000	8.83	1.21	31.9	21.1	15.1	13.0	11.3
7,200	9.08	1.28	33.6	22.2	15.9	13.7	11.9
7,400	9.33	1.35	35.4	23.4	16.7	14.4	12.6
7,600	9.58	1.43	37.2	24.6	17.5	15.1	13.2
7,800	9.83	1.50	39.0	25.8	18.4	15.9	13.8
8,000	10.10	1.59	40.8	27.0	19.3	16.6	14.5
8,200	10.30	1.65	42.8	28.3	20.2	17.4	15.2
8,400	10.60	1.75	44.7	29.6	21.1	18.2	15.9
8,600	10.80	1.81	46.7	30.9	22.1	19.0	16.6
8,800	11.10	1.91	48.7	32.2	23.0	19.8	17.3
9,000	11.30	1.98	50.8	33.6	24.0	20.7	18.0
9,200	11.60	2.09	52.9	35.0	25.0	21.5	18.8
9,400	11.90	2.20	55.0	36.4	26.0	22.4	19.5
9,600	12.10	2.28	57.2	37.9	27.0	23.3	20.3
9,800	12.40	2.39	59.5	39.3	28.1	24.2	21.1
10,000	12.60	2.47	61.7	40.8	29.2	25.1	21.9



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Flow of Water in Pipes

20 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
200	0.20	0.00	0.03	0.02	0.01	0.01	0.01
400	0.41	0.00	0.10	0.06	0.05	0.04	0.03
600	0.61	0.01	0.20	0.13	0.10	0.08	0.07
800	0.82	0.01	0.35	0.23	0.16	0.14	0.12
1,000	1.02	0.02	0.52	0.35	0.25	0.21	0.19
1,200	1.23	0.02	0.73	0.48	0.35	0.30	0.26
1,400	1.43	0.03	0.97	0.64	0.46	0.40	0.35
1,600	1.63	0.04	1.25	0.82	0.59	0.51	0.44
1,800	1.84	0.05	1.55	1.03	0.73	0.63	0.55
2,000	2.04	0.06	1.88	1.25	0.89	0.77	0.67
2,200	2.25	0.08	2.25	1.49	1.06	0.92	0.80
2,400	2.45	0.09	2.64	1.75	1.25	1.07	0.94
2,600	2.66	0.11	3.06	2.02	1.44	1.25	1.09
2,800	2.86	0.13	3.51	2.32	1.66	1.43	1.25
3,000	3.06	0.15	3.99	2.64	1.88	1.62	1.42
3,200	3.27	0.17	4.49	2.97	2.12	1.83	1.59
3,400	3.47	0.19	5.02	3.32	2.37	2.05	1.78
3,600	3.68	0.21	5.58	3.70	2.64	2.27	1.98
3,800	3.88	0.23	6.17	4.08	2.92	2.51	2.19
4,000	4.08	0.26	6.79	4.49	3.21	2.76	2.41
4,200	4.29	0.29	7.43	4.92	3.51	3.03	2.64
4,400	4.49	0.31	8.09	5.36	3.82	3.30	2.87
4,600	4.70	0.34	8.79	5.82	4.15	3.58	3.12
4,800	4.90	0.37	9.51	6.29	4.49	3.87	3.38
5,000	5.11	0.41	10.3	6.79	4.84	4.18	3.64
5,200	5.31	0.44	11.0	7.30	5.21	4.49	3.92
5,400	5.51	0.47	11.8	7.82	5.58	4.82	4.20
5,600	5.72	0.51	12.6	8.37	5.97	5.15	4.49
5,800	5.92	0.55	13.5	8.93	6.37	5.50	4.79
6,000	6.13	0.58	14.4	9.51	6.79	5.85	5.10
6,200	6.33	0.62	15.3	10.1	7.21	6.22	5.42
6,400	6.54	0.67	16.2	10.7	7.65	6.59	5.75
6,600	6.74	0.71	17.1	11.3	8.09	6.98	6.09
6,800	6.94	0.75	18.1	12.0	8.55	7.38	6.43
7,000	7.15	0.80	19.1	12.6	9.03	7.78	6.79
7,200	7.35	0.84	20.1	13.3	9.51	8.20	7.15
7,400	7.56	0.89	21.2	14.0	10.	8.63	7.52
7,600	7.76	0.94	22.2	14.7	10.5	9.06	7.90
7,800	7.97	0.99	23.3	15.4	11.0	9.51	8.29
8,000	8.17	1.04	24.5	16.2	11.6	9.96	8.69
8,200	8.37	1.09	25.6	16.9	12.1	10.4	9.09
8,400	8.58	1.14	26.8	17.7	12.6	10.9	9.51
8,600	8.78	1.20	28.0	18.5	13.2	11.4	9.93
8,800	8.99	1.26	29.2	19.3	13.8	11.9	10.4
9,000	9.19	1.31	30.4	20.1	14.4	12.4	10.8
9,200	9.40	1.37	31.7	21.0	15.0	12.9	11.3
9,400	9.60	1.43	33.0	21.8	15.6	13.4	11.7
9,600	9.80	1.49	34.3	22.7	16.2	14.0	12.2
9,800	10.00	1.55	35.6	23.6	16.8	14.5	12.6
10,000	10.20	1.62	37.0	24.5	17.5	15.1	13.1



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Flow of Water in Pipes

24 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
250	0.18	0.00	0.02	0.01	0.01	0.01	0.01
500	0.36	0.00	0.06	0.04	0.03	0.02	0.02
750	0.53	0.00	0.13	0.08	0.06	0.05	0.04
1,000	0.71	0.01	0.22	0.14	0.10	0.09	0.08
1,250	0.89	0.01	0.33	0.22	0.15	0.13	0.12
1,500	1.06	0.02	0.46	0.30	0.22	0.19	0.16
1,750	1.24	0.02	0.61	0.40	0.29	0.25	0.22
2,000	1.42	0.03	0.78	0.51	0.37	0.32	0.28
2,250	1.60	0.04	0.96	0.64	0.46	0.39	0.34
2,500	1.77	0.05	1.17	0.78	0.55	0.48	0.42
2,750	1.95	0.06	1.40	0.93	0.66	0.57	0.50
3,000	2.13	0.07	1.64	1.09	0.78	0.67	0.58
3,250	2.30	0.08	1.90	1.26	0.90	0.78	0.68
3,500	2.48	0.10	2.18	1.44	1.03	0.89	0.78
3,750	2.66	0.11	2.48	1.64	1.17	1.01	0.88
4,000	2.84	0.13	2.79	1.85	1.32	1.14	0.99
4,250	3.01	0.14	3.13	2.07	1.48	1.27	1.11
4,500	3.19	0.16	3.48	2.30	1.64	1.42	1.23
4,750	3.37	0.18	3.84	2.54	1.81	1.56	1.36
5,000	3.55	0.20	4.22	2.79	1.99	1.72	1.50
5,250	3.72	0.22	4.62	3.06	2.18	1.88	1.64
5,500	3.90	0.24	5.04	3.33	2.38	2.05	1.79
5,750	4.08	0.26	5.47	3.62	2.58	2.23	1.94
6,000	4.26	0.28	5.92	3.92	2.79	2.41	2.10
6,250	4.43	0.31	6.38	4.22	3.01	2.60	2.27
6,500	4.61	0.33	6.86	4.54	3.24	2.79	2.44
6,750	4.79	0.36	7.36	4.87	3.48	3.00	2.61
7,000	4.96	0.38	7.87	5.21	3.72	3.21	2.79
7,250	5.14	0.41	8.40	5.56	3.97	3.42	2.98
7,500	5.32	0.44	8.94	5.92	4.22	3.64	3.18
7,750	5.50	0.47	9.50	6.29	4.49	3.87	3.37
8,000	5.67	0.50	10.1	6.67	4.76	4.10	3.58
8,250	5.85	0.53	10.7	7.06	5.04	4.34	3.79
8,500	6.03	0.57	11.3	7.46	5.32	4.59	4.00
8,750	6.21	0.60	11.9	7.87	5.62	4.84	4.22
9,000	6.38	0.63	12.5	8.29	5.92	5.10	4.45
9,250	6.56	0.67	13.2	8.72	6.23	5.37	4.68
9,500	6.74	0.71	13.8	9.16	6.54	5.64	4.92
9,750	6.91	0.74	14.5	9.61	6.86	5.92	5.16
10,000	7.09	0.78	15.2	10.1	7.19	6.20	5.41
10,250	7.27	0.82	15.9	10.5	7.53	6.49	5.66
10,500	7.45	0.86	16.7	11.0	7.87	6.79	5.92
10,750	7.62	0.90	17.4	11.5	8.22	7.09	6.18
11,000	7.80	0.95	18.2	12.0	8.58	7.40	6.45
11,250	7.98	0.99	18.9	12.5	8.94	7.71	6.72
11,500	8.16	1.03	19.7	13.0	9.31	8.03	7.00
11,750	8.33	1.08	20.5	13.6	9.69	8.36	7.29
12,000	8.51	1.13	21.3	14.1	10.1	8.69	7.58
12,250	8.69	1.17	22.2	14.7	10.5	9.03	7.87
12,500	8.86	1.22	23.0	15.2	10.9	9.37	8.17



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Flow of Water in Pipes

30 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
500	0.23	0.00	0.02	0.01	0.01	0.01	0.01
1,000	0.45	0.00	0.07	0.05	0.03	0.03	0.03
1,500	0.68	0.01	0.15	0.10	0.07	0.06	0.05
2,000	0.91	0.01	0.26	0.17	0.12	0.11	0.09
2,500	1.13	0.02	0.40	0.26	0.19	0.16	0.14
3,000	1.36	0.03	0.55	0.37	0.26	0.23	0.20
3,500	1.59	0.04	0.74	0.49	0.35	0.30	0.26
4,000	1.82	0.05	0.94	0.63	0.45	0.38	0.34
4,500	2.04	0.06	1.17	0.78	0.55	0.48	0.42
5,000	2.27	0.08	1.43	0.94	0.67	0.58	0.51
5,500	2.50	0.10	1.70	1.13	0.80	0.69	0.60
6,000	2.72	0.12	2.00	1.32	0.94	0.81	0.71
6,500	2.95	0.14	2.32	1.53	1.09	0.94	0.82
7,000	3.18	0.16	2.66	1.76	1.26	1.08	0.94
7,500	3.40	0.18	3.02	2.00	1.43	1.23	1.07
8,000	3.63	0.21	3.40	2.25	1.61	1.39	1.21
8,500	3.86	0.23	3.81	2.52	1.80	1.55	1.35
9,000	4.08	0.26	4.23	2.80	2.00	1.72	1.50
9,500	4.31	0.29	4.68	3.09	2.21	1.90	1.66
10,000	4.54	0.32	5.14	3.40	2.43	2.09	1.83
10,500	4.77	0.35	5.63	3.72	2.66	2.29	2.00
11,000	4.99	0.39	6.13	4.06	2.90	2.50	2.18
11,500	5.22	0.42	6.66	4.41	3.14	2.71	2.36
12,000	5.45	0.46	7.20	4.77	3.40	2.93	2.56
12,500	5.67	0.50	7.77	5.14	3.67	3.16	2.76
13,000	5.90	0.54	8.35	5.53	3.95	3.40	2.97
13,500	6.13	0.58	8.96	5.93	4.23	3.65	3.18
14,000	6.35	0.63	9.58	6.34	4.53	3.90	3.40
14,500	6.58	0.67	10.2	6.77	4.83	4.16	3.63
15,000	6.81	0.72	10.9	7.20	5.14	4.43	3.87
15,500	7.04	0.77	11.6	7.65	5.46	4.71	4.11
16,000	7.26	0.82	12.3	8.12	5.79	5.00	4.36
16,500	7.49	0.87	13.0	8.59	6.13	5.29	4.61
17,000	7.72	0.93	13.7	9.08	6.48	5.59	4.87
17,500	7.94	0.98	14.5	9.58	6.84	5.90	5.14
18,000	8.17	1.04	15.3	10.1	7.20	6.21	5.42
18,500	8.40	1.10	16.0	10.6	7.58	6.53	5.70
19,000	8.62	1.15	16.9	11.2	7.96	6.87	5.99
19,500	8.85	1.22	17.7	11.7	8.35	7.20	6.28
20,000	9.08	1.28	18.5	12.3	8.75	7.55	6.58
20,500	9.30	1.34	19.4	12.8	9.16	7.90	6.89
21,000	9.53	1.41	20.3	13.4	9.58	8.26	7.20
21,500	9.76	1.48	21.2	14.0	10.	8.63	7.52
22,000	9.99	1.55	22.1	14.6	10.4	9.00	7.85
22,500	10.20	1.62	23.0	15.3	10.9	9.39	8.18
23,000	10.40	1.68	24.0	15.9	11.3	9.78	8.52
23,500	10.70	1.78	25.0	16.5	11.8	10.2	8.87
24,000	10.90	1.85	26.0	17.2	12.3	10.6	9.22
24,500	11.10	1.91	27.0	17.9	12.7	11.0	9.58
25,000	11.30	1.98	28.0	18.5	13.2	11.4	9.95



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Flow of Water in Pipes

36 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1,000	0.32	0.00	0.03	0.02	0.01	0.01	0.01
2,000	0.63	0.01	0.11	0.07	0.05	0.04	0.04
3,000	0.95	0.01	0.23	0.15	0.11	0.09	0.08
4,000	1.26	0.02	0.39	0.26	0.18	0.16	0.14
5,000	1.58	0.04	0.59	0.39	0.28	0.24	0.21
6,000	1.89	0.06	0.82	0.55	0.39	0.34	0.29
7,000	2.21	0.08	1.09	0.72	0.52	0.45	0.39
8,000	2.52	0.10	1.40	0.93	0.66	0.57	0.50
9,000	2.84	0.13	1.74	1.15	0.82	0.71	0.62
10,000	3.15	0.15	2.12	1.40	1.00	0.86	0.75
11,000	3.47	0.19	2.53	1.67	1.19	1.03	0.90
12,000	3.78	0.22	2.97	1.96	1.40	1.21	1.05
13,000	4.10	0.26	3.44	2.28	1.62	1.40	1.22
14,000	4.41	0.30	3.95	2.61	1.86	1.61	1.40
15,000	4.73	0.35	4.48	2.97	2.12	1.83	1.59
16,000	5.04	0.40	5.05	3.34	2.39	2.06	1.79
17,000	5.36	0.45	5.65	3.74	2.67	2.30	2.01
18,000	5.67	0.50	6.28	4.16	2.97	2.56	2.23
19,000	5.99	0.56	6.94	4.59	3.28	2.83	2.47
20,000	6.30	0.62	7.63	5.05	3.61	3.11	2.71
21,000	6.62	0.68	8.35	5.53	3.95	3.40	2.97
22,000	6.93	0.75	9.10	6.03	4.30	3.71	3.23
23,000	7.25	0.82	9.89	6.54	4.67	4.03	3.51
24,000	7.56	0.89	10.7	7.08	5.05	4.36	3.80
25,000	7.88	0.97	11.5	7.63	5.45	4.70	4.10
26,000	8.20	1.05	12.4	8.21	5.86	5.05	4.40
27,000	8.51	1.13	13.3	8.80	6.28	5.42	4.72
28,000	8.83	1.21	14.2	9.41	6.72	5.79	5.05
29,000	9.14	1.30	15.2	10.	7.17	6.18	5.39
30,000	9.46	1.39	16.2	10.7	7.63	6.58	5.74
31,000	9.77	1.48	17.2	11.4	8.11	6.99	6.10
32,000	10.10	1.59	18.2	12.1	8.60	7.42	6.47
33,000	10.40	1.68	19.3	12.8	9.10	7.85	6.85
34,000	10.70	1.78	20.4	13.5	9.62	8.30	7.23
35,000	11.00	1.88	21.5	14.2	10.2	8.75	7.63
36,000	11.30	1.98	22.6	15.0	10.7	9.22	8.04
37,000	11.70	2.13	23.8	15.8	11.3	9.70	8.46
38,000	12.00	2.24	25.0	16.6	11.8	10.2	8.89
39,000	12.30	2.35	26.3	17.4	12.4	10.7	9.32
40,000	12.60	2.47	27.5	18.2	13.0	11.2	9.77
41,000	12.90	2.59	28.8	19.1	13.6	11.7	10.2
42,000	13.20	2.71	30.1	19.9	14.2	12.3	10.7
43,000	13.60	2.87	31.5	20.8	14.9	12.8	11.2
44,000	13.90	3.00	32.8	21.7	15.5	13.4	11.7
45,000	14.20	3.13	34.2	22.6	16.2	13.9	12.2
46,000	14.50	3.27	35.6	23.6	16.8	14.5	12.7
47,000	14.80	3.40	37.1	24.5	17.5	15.1	13.2
48,000	15.10	3.54	38.6	25.5	18.2	15.7	13.7
49,000	15.40	3.69	40.1	26.5	18.9	16.3	14.2
50,000	15.80	3.88	41.6	27.5	19.6	16.9	14.8



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Flow of Water in Pipes

42 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1,000	0.23	0.00	0.01	0.01	0.01	0.01	0.01
2,000	0.46	0.00	0.05	0.03	0.02	0.02	0.02
3,000	0.70	0.01	0.11	0.07	0.05	0.04	0.04
4,000	0.93	0.01	0.18	0.12	0.09	0.07	0.07
5,000	1.16	0.02	0.28	0.18	0.13	0.11	0.10
6,000	1.39	0.03	0.39	0.26	0.18	0.16	0.14
7,000	1.62	0.04	0.52	0.34	0.24	0.21	0.18
8,000	1.85	0.05	0.66	0.44	0.31	0.27	0.24
9,000	2.08	0.07	0.82	0.55	0.39	0.34	0.29
10,000	2.32	0.08	1.00	0.66	0.47	0.41	0.36
11,000	2.55	0.10	1.19	0.79	0.56	0.49	0.42
12,000	2.78	0.12	1.40	0.93	0.66	0.57	0.50
13,000	3.01	0.14	1.63	1.08	0.77	0.66	0.58
14,000	3.24	0.16	1.86	1.23	0.88	0.76	0.66
15,000	3.47	0.19	2.12	1.40	1.00	0.86	0.75
16,000	3.71	0.21	2.39	1.58	1.13	0.97	0.85
17,000	3.94	0.24	2.67	1.77	1.26	1.09	0.95
18,000	4.17	0.27	2.97	1.96	1.40	1.21	1.05
19,000	4.40	0.30	3.28	2.17	1.55	1.34	1.16
20,000	4.63	0.33	3.61	2.39	1.70	1.47	1.28
21,000	4.86	0.37	3.95	2.61	1.86	1.61	1.40
22,000	5.09	0.40	4.30	2.85	2.03	1.75	1.53
23,000	5.33	0.44	4.67	3.09	2.21	1.90	1.66
24,000	5.56	0.48	5.05	3.34	2.39	2.06	1.79
25,000	5.79	0.52	5.45	3.61	2.57	2.22	1.93
26,000	6.02	0.56	5.86	3.88	2.77	2.39	2.08
27,000	6.25	0.61	6.28	4.16	2.97	2.56	2.23
28,000	6.48	0.65	6.72	4.45	3.17	2.74	2.39
29,000	6.72	0.70	7.17	4.74	3.39	2.92	2.55
30,000	6.95	0.75	7.63	5.05	3.61	3.11	2.71
31,000	7.18	0.80	8.11	5.37	3.83	3.30	2.88
32,000	7.41	0.85	8.60	5.69	4.06	3.50	3.05
33,000	7.64	0.91	9.11	6.03	4.30	3.71	3.23
34,000	7.87	0.96	9.62	6.37	4.54	3.92	3.42
35,000	8.11	1.02	10.2	6.72	4.80	4.14	3.61
36,000	8.34	1.08	10.7	7.08	5.05	4.36	3.80
37,000	8.57	1.14	11.3	7.45	5.31	4.58	4.00
38,000	8.80	1.20	11.8	7.82	5.58	4.81	4.20
39,000	9.03	1.27	12.4	8.21	5.86	5.05	4.40
40,000	9.26	1.33	13.0	8.60	6.14	5.29	4.62
41,000	9.49	1.40	13.6	9.00	6.43	5.54	4.83
42,000	9.73	1.47	14.2	9.41	6.72	5.79	5.05
43,000	9.96	1.54	14.9	9.83	7.02	6.05	5.28
44,000	10.20	1.62	15.5	10.3	7.32	6.31	5.51
45,000	10.40	1.68	16.2	10.7	7.63	6.58	5.74
46,000	10.70	1.78	16.8	11.1	7.95	6.86	5.98
47,000	10.90	1.85	17.5	11.6	8.27	7.13	6.22
48,000	11.10	1.91	18.2	12.1	8.60	7.42	6.47
49,000	11.30	1.98	18.9	12.5	8.94	7.71	6.72
50,000	11.60	2.09	19.6	13.0	9.28	8.00	6.97



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Flow of Water in Pipes

48 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1,000	0.18	0.00	0.01	0.00	0.00	0.00	0.00
2,000	0.36	0.00	0.03	0.02	0.01	0.01	0.01
3,000	0.53	0.00	0.06	0.04	0.03	0.02	0.02
4,000	0.71	0.01	0.10	0.06	0.05	0.04	0.03
5,000	0.89	0.01	0.15	0.10	0.07	0.06	0.05
6,000	1.06	0.02	0.20	0.13	0.10	0.08	0.07
7,000	1.24	0.02	0.27	0.18	0.13	0.11	0.10
8,000	1.42	0.03	0.35	0.23	0.16	0.14	0.12
9,000	1.60	0.04	0.43	0.28	0.20	0.18	0.15
10,000	1.77	0.05	0.52	0.35	0.25	0.21	0.19
11,000	1.95	0.06	0.62	0.41	0.29	0.25	0.22
12,000	2.13	0.07	0.73	0.48	0.35	0.30	0.26
13,000	2.30	0.08	0.85	0.56	0.40	0.35	0.30
14,000	2.48	0.10	0.97	0.64	0.46	0.40	0.35
15,000	2.66	0.11	1.11	0.73	0.52	0.45	0.39
16,000	2.84	0.13	1.25	0.83	0.59	0.51	0.44
17,000	3.01	0.14	1.39	0.92	0.66	0.57	0.50
18,000	3.19	0.16	1.55	1.03	0.73	0.63	0.55
19,000	3.37	0.18	1.71	1.13	0.81	0.70	0.61
20,000	3.55	0.20	1.88	1.25	0.89	0.77	0.67
21,000	3.72	0.22	2.06	1.36	0.97	0.84	0.73
22,000	3.90	0.24	2.25	1.49	1.06	0.92	0.80
23,000	4.08	0.26	2.44	1.61	1.15	0.99	0.87
24,000	4.26	0.28	2.64	1.75	1.25	1.07	0.94
25,000	4.43	0.31	2.85	1.88	1.34	1.16	1.01
26,000	4.61	0.33	3.06	2.02	1.44	1.25	1.09
27,000	4.79	0.36	3.28	2.17	1.55	1.34	1.16
28,000	4.96	0.38	3.51	2.32	1.66	1.43	1.25
29,000	5.14	0.41	3.74	2.48	1.77	1.52	1.33
30,000	5.32	0.44	3.99	2.64	1.88	1.62	1.42
31,000	5.50	0.47	4.24	2.80	2.00	1.73	1.50
32,000	5.67	0.50	4.49	2.97	2.12	1.83	1.60
33,000	5.85	0.53	4.76	3.15	2.25	1.94	1.69
34,000	6.03	0.57	5.03	3.33	2.37	2.05	1.78
35,000	6.21	0.60	5.30	3.51	2.50	2.16	1.88
36,000	6.38	0.63	5.59	3.70	2.64	2.28	1.98
37,000	6.56	0.67	5.88	3.89	2.78	2.39	2.09
38,000	6.74	0.71	6.17	4.09	2.92	2.51	2.19
39,000	6.91	0.74	6.48	4.29	3.06	2.64	2.30
40,000	7.09	0.78	6.79	4.49	3.21	2.76	2.41
41,000	7.27	0.82	7.10	4.70	3.36	2.89	2.52
42,000	7.45	0.86	7.43	4.92	3.51	3.03	2.64
43,000	7.62	0.90	7.76	5.13	3.66	3.16	2.76
44,000	7.80	0.95	8.10	5.36	3.82	3.30	2.88
45,000	7.98	0.99	8.44	5.59	3.99	3.44	3.00
46,000	8.16	1.03	8.79	5.82	4.15	3.58	3.12
47,000	8.33	1.08	9.15	6.05	4.32	3.73	3.25
48,000	8.51	1.13	9.51	6.29	4.49	3.87	3.38
49,000	8.69	1.17	9.88	6.54	4.67	4.02	3.51
50,000	8.86	1.22	10.3	6.79	4.84	4.18	3.64



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Flow of Water in Pipes

54 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2,000	0.28	0.00	0.02	0.01	0.01	0.01	0.01
4,000	0.56	0.00	0.05	0.04	0.03	0.02	0.02
6,000	0.84	0.01	0.11	0.08	0.05	0.05	0.04
8,000	1.12	0.02	0.20	0.13	0.09	0.08	0.07
10,000	1.40	0.03	0.29	0.20	0.14	0.12	0.11
12,000	1.68	0.04	0.41	0.27	0.20	0.17	0.15
14,000	1.96	0.06	0.55	0.36	0.26	0.22	0.20
16,000	2.24	0.08	0.70	0.47	0.33	0.29	0.25
18,000	2.52	0.10	0.87	0.58	0.41	0.36	0.31
20,000	2.80	0.12	1.06	0.70	0.50	0.43	0.38
22,000	3.08	0.15	1.27	0.84	0.60	0.52	0.45
24,000	3.36	0.18	1.49	0.98	0.70	0.61	0.53
26,000	3.64	0.21	1.72	1.14	0.82	0.70	0.61
28,000	3.92	0.24	1.98	1.31	0.93	0.81	0.70
30,000	4.20	0.27	2.25	1.49	1.06	0.92	0.80
32,000	4.48	0.31	2.53	1.68	1.20	1.03	0.90
34,000	4.76	0.35	2.83	1.87	1.34	1.15	1.01
36,000	5.04	0.40	3.15	2.08	1.49	1.28	1.12
38,000	5.32	0.44	3.48	2.30	1.64	1.42	1.24
40,000	5.60	0.49	3.83	2.53	1.81	1.56	1.36
42,000	5.88	0.54	4.19	2.77	1.98	1.71	1.49
44,000	6.16	0.59	4.56	3.02	2.16	1.86	1.62
46,000	6.44	0.65	4.96	3.28	2.34	2.02	1.76
48,000	6.72	0.70	5.36	3.55	2.53	2.18	1.90
50,000	7.00	0.76	5.78	3.83	2.73	2.36	2.05
52,000	7.28	0.82	6.22	4.11	2.94	2.53	2.21
54,000	7.56	0.89	6.67	4.41	3.15	2.72	2.37
56,000	7.84	0.96	7.13	4.72	3.37	2.90	2.53
58,000	8.13	1.03	7.61	5.04	3.59	3.10	2.70
60,000	8.41	1.10	8.10	5.36	3.83	3.30	2.88
62,000	8.69	1.17	8.61	5.70	4.07	3.51	3.06
64,000	8.97	1.25	9.13	6.04	4.31	3.72	3.24
66,000	9.25	1.33	9.66	6.40	4.56	3.94	3.43
68,000	9.53	1.41	10.2	6.76	4.82	4.16	3.63
70,000	9.81	1.50	10.8	7.13	5.09	4.39	3.83
72,000	10.10	1.59	11.4	7.51	5.36	4.62	4.03
74,000	10.40	1.68	11.9	7.90	5.64	4.86	4.24
76,000	10.60	1.75	12.5	8.30	5.93	5.11	4.46
78,000	10.90	1.85	13.2	8.71	6.22	5.36	4.67
80,000	11.20	1.95	13.8	9.13	6.52	5.62	4.90
82,000	11.50	2.06	14.4	9.56	6.82	5.88	5.13
84,000	11.80	2.16	15.1	9.99	7.13	6.15	5.36
86,000	12.00	2.24	15.8	10.4	7.45	6.42	5.60
88,000	12.30	2.35	16.5	10.9	7.77	6.70	5.84
90,000	12.60	2.47	17.2	11.4	8.10	6.99	6.09
92,000	12.90	2.59	17.9	11.8	8.44	7.28	6.34
94,000	13.20	2.71	18.6	12.3	8.78	7.57	6.60
96,000	13.40	2.79	19.3	12.8	9.13	7.87	6.86
98,000	13.70	2.92	20.1	13.3	9.48	8.18	7.13
100,000	14.00	3.05	20.8	13.8	9.85	8.49	7.40



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Flow of Water in Pipes

60 Inch Diameter Pipe							
Flow GPM	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2,000	0.23	0.00	0.01	0.01	0.00	0.00	0.00
4,000	0.45	0.00	0.03	0.02	0.02	0.01	0.01
6,000	0.68	0.01	0.07	0.05	0.03	0.03	0.02
8,000	0.91	0.01	0.12	0.08	0.06	0.05	0.04
10,000	1.13	0.02	0.18	0.12	0.08	0.07	0.06
12,000	1.36	0.03	0.25	0.16	0.12	0.10	0.09
14,000	1.59	0.04	0.33	0.22	0.16	0.13	0.12
16,000	1.82	0.05	0.42	0.28	0.20	0.17	0.15
18,000	2.04	0.06	0.52	0.35	0.25	0.21	0.19
20,000	2.27	0.08	0.64	0.42	0.30	0.26	0.23
22,000	2.50	0.10	0.76	0.50	0.36	0.31	0.27
24,000	2.72	0.12	0.89	0.59	0.42	0.36	0.32
26,000	2.95	0.14	1.03	0.68	0.49	0.42	0.37
28,000	3.18	0.16	1.18	0.78	0.56	0.48	0.42
30,000	3.40	0.18	1.35	0.89	0.64	0.55	0.48
32,000	3.63	0.21	1.52	1.00	0.72	0.62	0.54
34,000	3.86	0.23	1.70	1.12	0.80	0.69	0.60
36,000	4.08	0.26	1.89	1.25	0.89	0.77	0.67
38,000	4.31	0.29	2.08	1.38	0.99	0.85	0.74
40,000	4.54	0.32	2.29	1.52	1.08	0.93	0.81
42,000	4.77	0.35	2.51	1.66	1.18	1.02	0.89
44,000	4.99	0.39	2.73	1.81	1.29	1.11	0.97
46,000	5.22	0.42	2.97	1.96	1.40	1.21	1.05
48,000	5.45	0.46	3.21	2.13	1.52	1.31	1.14
50,000	5.67	0.50	3.46	2.29	1.64	1.41	1.23
52,000	5.90	0.54	3.72	2.46	1.76	1.52	1.32
54,000	6.13	0.58	3.99	2.64	1.89	1.63	1.42
56,000	6.35	0.63	4.27	2.83	2.02	1.74	1.52
58,000	6.58	0.67	4.56	3.02	2.15	1.86	1.62
60,000	6.81	0.72	4.85	3.21	2.29	1.98	1.72
62,000	7.04	0.77	5.16	3.41	2.44	2.10	1.83
64,000	7.26	0.82	5.47	3.62	2.58	2.23	1.94
66,000	7.49	0.87	5.79	3.83	2.73	2.36	2.06
68,000	7.72	0.93	6.12	4.05	2.89	2.49	2.17
70,000	7.94	0.98	6.45	4.27	3.05	2.63	2.29
72,000	8.17	1.04	6.80	4.50	3.21	2.77	2.41
74,000	8.40	1.10	7.15	4.73	3.38	2.91	2.54
76,000	8.62	1.15	7.51	4.97	3.55	3.06	2.67
78,000	8.85	1.22	7.88	5.22	3.72	3.21	2.80
80,000	9.08	1.28	8.26	5.47	3.90	3.37	2.93
82,000	9.30	1.34	8.65	5.72	4.08	3.52	3.07
84,000	9.53	1.41	9.04	5.98	4.27	3.68	3.21
86,000	9.76	1.48	9.45	6.25	4.46	3.85	3.35
88,000	9.99	1.55	9.86	6.52	4.65	4.01	3.50
90,000	10.20	1.62	10.3	6.80	4.85	4.18	3.65
92,000	10.40	1.68	10.7	7.08	5.05	4.36	3.80
94,000	10.70	1.78	11.1	7.37	5.26	4.54	3.95
96,000	10.90	1.85	11.6	7.66	5.47	4.72	4.11
98,000	11.10	1.91	12.0	7.96	5.68	4.90	4.27
100,000	11.30	1.98	12.5	8.26	5.90	5.09	4.43



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MGD

Flow of Water in Pipes

3 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.01	0.32	0.00	0.54	0.36	0.26	0.22	0.19
0.02	0.63	0.01	1.95	1.29	0.92	0.80	0.69
0.03	0.95	0.01	4.13	2.74	1.95	1.68	1.47
0.04	1.26	0.02	7.04	4.66	3.32	2.87	2.50
0.05	1.58	0.04	10.6	7.04	5.02	4.33	3.78
0.06	1.89	0.06	14.9	9.86	7.04	6.07	5.29
0.07	2.21	0.08	19.8	13.1	9.36	8.07	7.04
0.08	2.52	0.10	25.4	16.8	12.0	10.3	9.01
0.09	2.84	0.13	31.5	20.9	14.9	12.8	11.2
0.1	3.15	0.15	38.3	25.4	18.1	15.6	13.6
0.11	3.47	0.19	45.7	30.3	21.6	18.6	16.2
0.12	3.78	0.22	53.7	35.5	25.4	21.9	19.1
0.13	4.10	0.26	62.3	41.2	29.4	25.4	22.1
0.14	4.41	0.30	71.4	47.3	33.7	29.1	25.4
0.15	4.73	0.35	81.2	53.7	38.3	33.1	28.8
0.16	5.04	0.40	91.5	60.5	43.2	37.2	32.5
0.17	5.36	0.45	102	67.7	48.3	41.7	36.3
0.18	5.67	0.50	114	75.3	53.7	46.3	40.4
0.19	5.99	0.56	126	83.2	59.4	51.2	44.6
0.2	6.30	0.62	138	91.5	65.3	56.3	49.1
0.21	6.62	0.68	151	100	71.4	61.6	53.7
0.22	6.93	0.75	165	109	77.9	67.1	58.5
0.23	7.25	0.82	179	118	84.5	72.9	63.6
0.24	7.56	0.89	194	128	91.5	78.9	68.8
0.25	7.88	0.97	209	138	98.6	85.1	74.2
0.26	8.20	1.05	225	149	106	91.5	79.7
0.27	8.51	1.13	241	159	114	98.1	85.5
0.28	8.83	1.21	258	170	122	105	91.5
0.29	9.14	1.30	275	182	130	112	97.6
0.3	9.46	1.39	293	194	138	119	104
0.31	9.77	1.48	311	206	147	127	110
0.32	10.1	1.59	330	218	156	134	117
0.33	10.4	1.68	349	231	165	142	124
0.34	10.7	1.78	369	244	174	150	131
0.35	11.0	1.88	389	258	184	158	138
0.36	11.3	1.98	410	271	194	167	146
0.37	11.7	2.13	431	285	204	176	153
0.38	12.0	2.24	453	300	214	185	161
0.39	12.3	2.35	475	315	225	194	169
0.4	12.6	2.47	498	330	235	203	177
0.41	12.9	2.59	521	345	246	212	185
0.42	13.2	2.71	545	361	258	222	194
0.43	13.6	2.87	570	377	269	232	202
0.44	13.9	3.00	594	393	281	242	211
0.45	14.2	3.13	619	410	293	252	220
0.46	14.5	3.27	645	427	305	263	229
0.47	14.8	3.40	671	444	317	273	238
0.48	15.1	3.54	698	462	330	284	248
0.49	15.4	3.69	725	480	343	295	258
0.5	15.8	3.88	753	498	356	307	267



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Flow of Water in Pipes

4 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.02	0.36	0.00	0.48	0.32	0.23	0.20	0.17
0.04	0.71	0.01	1.74	1.15	0.82	0.71	0.62
0.06	1.06	0.02	3.68	2.43	1.74	1.50	1.31
0.08	1.42	0.03	6.26	4.14	2.96	2.55	2.22
0.1	1.77	0.05	9.46	6.26	4.47	3.85	3.36
0.12	2.13	0.07	13.2	8.77	6.26	5.40	4.70
0.14	2.48	0.10	17.6	11.7	8.32	7.18	6.26
0.16	2.84	0.13	22.6	14.9	10.7	9.19	8.01
0.18	3.19	0.16	28.1	18.6	13.2	11.4	9.96
0.2	3.55	0.20	34.1	22.6	16.1	13.9	12.1
0.22	3.90	0.24	40.7	26.9	19.2	16.6	14.4
0.24	4.26	0.28	47.8	31.6	22.6	19.5	17.0
0.26	4.61	0.33	55.4	36.7	26.2	22.6	19.7
0.28	4.96	0.38	63.5	42.0	30.0	25.9	22.6
0.3	5.32	0.44	72.2	47.8	34.1	29.4	25.6
0.32	5.67	0.50	81.3	53.8	38.4	33.1	28.9
0.34	6.03	0.57	91.0	60.2	43.0	37.1	32.3
0.36	6.38	0.63	101	66.9	47.8	41.2	35.9
0.38	6.74	0.71	112	74	52.8	45.5	39.7
0.4	7.09	0.78	123	81.3	58	50.1	43.6
0.42	7.45	0.86	134	89	63.5	54.8	47.8
0.44	7.80	0.95	147	97	69.2	59.7	52.1
0.46	8.16	1.03	159	105	75.2	64.8	56.5
0.48	8.51	1.13	172	114	81.3	70.1	61.1
0.5	8.86	1.22	186	123	87.7	75.6	65.9
0.52	9.22	1.32	200	132	94.3	81.3	70.9
0.54	9.57	1.42	214	142	101	87.2	76
0.56	9.93	1.53	229	152	108	93.3	81.3
0.58	10.30	1.65	244	162	115	99.5	86.8
0.6	10.60	1.75	260	172	123	106	92.4
0.62	11.00	1.88	276	183	131	113	98.2
0.64	11.30	1.98	293	194	138	119	104
0.66	11.70	2.13	310	205	147	126	110
0.68	12.10	2.28	328	217	155	134	116
0.7	12.40	2.39	346	229	163	141	123
0.72	12.80	2.55	365	241	172	148	129
0.74	13.10	2.67	384	254	181	156	136
0.76	13.50	2.83	403	267	190	164	143
0.78	13.80	2.96	423	280	200	172	150
0.8	14.20	3.13	443	293	209	180	157
0.82	14.50	3.27	464	307	219	189	165
0.84	14.90	3.45	485	321	229	197	172
0.86	15.20	3.59	506	335	239	206	180
0.88	15.60	3.78	528	350	250	215	188
0.9	16.00	3.98	551	365	260	224	196
0.92	16.30	4.13	574	380	271	234	204
0.94	16.70	4.33	597	395	282	243	212
0.96	17.00	4.49	621	411	293	253	220
0.98	17.40	4.71	645	427	305	263	229
1	17.70	4.87	669	443	316	273	238



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Flow of Water in Pipes

6 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.05	0.39	0.00	0.37	0.24	0.17	0.15	0.13
0.1	0.79	0.01	1.31	0.87	0.62	0.54	0.47
0.15	1.18	0.02	2.78	1.84	1.31	1.13	0.99
0.2	1.58	0.04	4.74	3.14	2.24	1.93	1.68
0.25	1.97	0.06	7.16	4.74	3.38	2.92	2.54
0.3	2.36	0.09	10.0	6.64	4.74	4.09	3.56
0.35	2.76	0.12	13.3	8.83	6.30	5.44	4.74
0.4	3.15	0.15	17.1	11.3	8.07	6.96	6.07
0.45	3.55	0.20	21.3	14.1	10.0	8.66	7.55
0.5	3.94	0.24	25.8	17.1	12.2	10.5	9.17
0.55	4.33	0.29	30.8	20.4	14.5	12.5	10.9
0.6	4.73	0.35	36.2	23.9	17.1	14.7	12.8
0.65	5.12	0.41	42.0	27.8	19.8	17.1	14.9
0.7	5.52	0.47	48.1	31.8	22.7	19.6	17.1
0.75	5.91	0.54	54.7	36.2	25.8	22.3	19.4
0.8	6.30	0.62	61.6	40.8	29.1	25.1	21.9
0.85	6.70	0.70	68.9	45.6	32.6	28.1	24.5
0.9	7.09	0.78	76.6	50.7	36.2	31.2	27.2
0.95	7.49	0.87	84.7	56.0	40.0	34.5	30.1
1	7.88	0.97	93.1	61.6	44.0	37.9	33.1
1.05	8.27	1.06	102	67.4	48.1	41.5	36.2
1.1	8.67	1.17	111	73.5	52.4	45.2	39.4
1.15	9.06	1.28	121	79.8	56.9	49.1	42.8
1.2	9.46	1.39	130	86.3	61.6	53.1	46.3
1.25	9.85	1.51	141	93.1	66.4	57.3	50.0
1.3	10.20	1.62	151	100.	71.4	61.6	53.7
1.35	10.60	1.75	162	107	76.6	66.1	57.6
1.4	11.00	1.88	173	115	81.9	70.7	61.6
1.45	11.40	2.02	185	123	87.4	75.4	65.7
1.5	11.80	2.16	197	130	93.1	80.3	70.0
1.55	12.20	2.31	209	139	98.9	85.3	74.4
1.6	12.60	2.47	222	147	105	90.5	78.9
1.65	13.00	2.63	235	156	111	95.8	83.5
1.7	13.40	2.79	248	164	117	101	88.2
1.75	13.80	2.96	262	173	124	107	93.1
1.8	14.20	3.13	276	183	130	112	98.1
1.85	14.60	3.31	291	192	137	118	103
1.9	15.00	3.50	305	202	144	124	108
1.95	15.40	3.69	320	212	151	130	114
2	15.80	3.88	336	222	159	137	119
2.05	16.20	4.08	351	232	166	143	125
2.1	16.50	4.23	367	243	173	150	130
2.15	16.90	4.44	384	254	181	156	136
2.2	17.30	4.65	400	265	189	163	142
2.25	17.70	4.87	417	276	197	170	148
2.3	18.10	5.09	435	288	205	177	154
2.35	18.50	5.32	452	299	214	184	161
2.4	18.90	5.55	470	311	222	192	167
2.45	19.30	5.79	489	323	231	199	173
2.5	19.70	6.03	507	336	240	207	180



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Flow of Water in Pipes

8 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.44	0.00	0.32	0.22	0.15	0.13	0.12
0.2	0.89	0.01	1.17	0.77	0.55	0.48	0.42
0.3	1.33	0.03	2.48	1.64	1.17	1.01	0.88
0.4	1.77	0.05	4.22	2.79	1.99	1.72	1.50
0.5	2.22	0.08	6.37	4.22	3.01	2.59	2.26
0.6	2.66	0.11	8.93	5.91	4.22	3.64	3.17
0.7	3.10	0.15	11.9	7.86	5.61	4.83	4.22
0.8	3.55	0.20	15.2	10.1	7.18	6.19	5.40
0.9	3.99	0.25	18.9	12.5	8.93	7.70	6.71
1	4.43	0.31	23.0	15.2	10.8	9.35	8.15
1.1	4.88	0.37	27.4	18.1	12.9	11.2	9.73
1.2	5.32	0.44	32.2	21.3	15.2	13.1	11.4
1.3	5.76	0.52	37.3	24.7	17.6	15.2	13.2
1.4	6.21	0.60	42.8	28.3	20.2	17.4	15.2
1.5	6.65	0.69	48.6	32.2	23.0	19.8	17.3
1.6	7.09	0.78	54.8	36.3	25.9	22.3	19.5
1.7	7.54	0.88	61.3	40.6	28.9	25.0	21.8
1.8	7.98	0.99	68.1	45.1	32.2	27.7	24.2
1.9	8.42	1.10	75.3	49.8	35.6	30.7	26.7
2	8.86	1.22	82.8	54.8	39.1	33.7	29.4
2.1	9.31	1.35	90.6	60.0	42.8	36.9	32.2
2.2	9.75	1.48	98.7	65.3	46.6	40.2	35.1
2.3	10.20	1.62	107	70.9	50.6	43.7	38.1
2.4	10.60	1.75	116	76.8	54.8	47.2	41.2
2.5	11.10	1.91	125	82.8	59.1	50.9	44.4
2.6	11.50	2.06	135	89.0	63.5	54.8	47.8
2.7	12.00	2.24	144	95.4	68.1	58.7	51.2
2.8	12.40	2.39	154	102	72.9	62.8	54.8
2.9	12.90	2.59	165	109	77.7	67.0	58.5
3	13.30	2.75	175	116	82.8	71.4	62.2
3.1	13.70	2.92	186	123	88.0	75.9	66.1
3.2	14.20	3.13	197	131	93.3	80.4	70.1
3.3	14.60	3.31	209	138	98.7	85.2	74.2
3.4	15.10	3.54	221	146	104	90.0	78.5
3.5	15.50	3.73	233	154	110	94.9	82.8
3.6	16.00	3.98	246	163	116	100.	87.2
3.7	16.40	4.18	258	171	122	105	91.7
3.8	16.80	4.39	271	180	128	111	96.4
3.9	17.30	4.65	285	188	135	116	101
4	17.70	4.87	298	197	141	122	106
4.1	18.20	5.15	312	207	148	127	111
4.2	18.60	5.38	327	216	154	133	116
4.3	19.10	5.67	341	226	161	139	121
4.4	19.50	5.91	356	236	168	145	126
4.5	19.90	6.15	371	246	175	151	132
4.6	20.40	6.47	386	256	183	157	137
4.7	20.80	6.72	402	266	190	164	143
4.8	21.30	7.05	418	277	197	170	148
4.9	21.70	7.32	434	287	205	177	154
5	22.20	7.66	451	298	213	184	160



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Flow of Water in Pipes

10 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.28	0.00	0.11	0.07	0.05	0.04	0.04
0.2	0.57	0.01	0.40	0.26	0.19	0.16	0.14
0.3	0.85	0.01	0.84	0.55	0.40	0.34	0.30
0.4	1.13	0.02	1.42	0.94	0.67	0.58	0.51
0.5	1.42	0.03	2.15	1.42	1.02	0.88	0.76
0.6	1.70	0.04	3.01	1.99	1.42	1.23	1.07
0.7	1.99	0.06	4.01	2.65	1.89	1.63	1.42
0.8	2.27	0.08	5.13	3.40	2.42	2.09	1.82
0.9	2.55	0.10	6.38	4.22	3.01	2.60	2.27
1	2.84	0.13	7.75	5.13	3.66	3.16	2.75
1.1	3.12	0.15	9.25	6.12	4.37	3.77	3.28
1.2	3.40	0.18	10.9	7.19	5.13	4.43	3.86
1.3	3.69	0.21	12.6	8.34	5.95	5.13	4.47
1.4	3.97	0.25	14.4	9.56	6.82	5.89	5.13
1.5	4.26	0.28	16.4	10.9	7.75	6.69	5.83
1.6	4.54	0.32	18.5	12.2	8.74	7.53	6.57
1.7	4.82	0.36	20.7	13.7	9.77	8.43	7.35
1.8	5.11	0.41	23.0	15.2	10.9	9.37	8.17
1.9	5.39	0.45	25.4	16.8	12.0	10.4	9.03
2	5.67	0.50	28.0	18.5	13.2	11.4	9.93
2.1	5.96	0.55	30.6	20.2	14.4	12.5	10.9
2.2	6.24	0.61	33.3	22.1	15.7	13.6	11.8
2.3	6.52	0.66	36.2	24.0	17.1	14.7	12.9
2.4	6.81	0.72	39.2	25.9	18.5	16.0	13.9
2.5	7.09	0.78	42.2	28.0	19.9	17.2	15.0
2.6	7.38	0.85	45.4	30.1	21.5	18.5	16.1
2.7	7.66	0.91	48.7	32.2	23.0	19.8	17.3
2.8	7.94	0.98	52.1	34.5	24.6	21.2	18.5
2.9	8.23	1.05	55.6	36.8	26.3	22.6	19.7
3	8.51	1.13	59.2	39.2	28.0	24.1	21.0
3.1	8.79	1.20	62.9	41.6	29.7	25.6	22.3
3.2	9.08	1.28	66.7	44.1	31.5	27.2	23.7
3.3	9.36	1.36	70.6	46.7	33.3	28.8	25.1
3.4	9.64	1.44	74.6	49.4	35.2	30.4	26.5
3.5	9.93	1.53	78.7	52.1	37.2	32.1	28.0
3.6	10.20	1.62	82.9	54.9	39.2	33.8	29.4
3.7	10.50	1.71	87.2	57.7	41.2	35.5	31.0
3.8	10.80	1.81	91.6	60.6	43.3	37.3	32.5
3.9	11.10	1.91	96.2	63.6	45.4	39.2	34.1
4	11.30	1.98	101	66.7	47.6	41.0	35.8
4.1	11.60	2.09	105	69.8	49.8	43.0	37.5
4.2	11.90	2.20	110	73.0	52.1	44.9	39.2
4.3	12.20	2.31	115	76.2	54.4	46.9	40.9
4.4	12.50	2.43	120	79.5	56.8	49.0	42.7
4.5	12.80	2.55	125	82.9	59.2	51.0	44.5
4.6	13.00	2.63	131	86.4	61.6	53.2	46.3
4.7	13.30	2.75	136	89.9	64.1	55.3	48.2
4.8	13.60	2.87	141	93.4	66.7	57.5	50.1
4.9	13.90	3.00	147	97.1	69.3	59.7	52.1
5	14.20	3.13	152	101	71.9	62.0	54.1



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Flow of Water in Pipes

12 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.39	0.00	0.16	0.11	0.08	0.07	0.06
0.4	0.79	0.01	0.59	0.39	0.28	0.24	0.21
0.6	1.18	0.02	1.24	0.82	0.59	0.51	0.44
0.8	1.58	0.04	2.11	1.40	1.00	0.86	0.75
1	1.97	0.06	3.19	2.11	1.51	1.30	1.13
1.2	2.36	0.09	4.47	2.96	2.11	1.82	1.59
1.4	2.76	0.12	5.95	3.94	2.81	2.42	2.11
1.6	3.15	0.15	7.62	5.04	3.60	3.10	2.71
1.8	3.55	0.20	9.47	6.27	4.47	3.86	3.36
2	3.94	0.24	11.5	7.62	5.44	4.69	4.09
2.2	4.33	0.29	13.7	9.09	6.49	5.59	4.88
2.4	4.73	0.35	16.1	10.7	7.62	6.57	5.73
2.6	5.12	0.41	18.7	12.4	8.83	7.62	6.64
2.8	5.52	0.47	21.5	14.2	10.1	8.74	7.62
3	5.91	0.54	24.4	16.1	11.5	9.93	8.66
3.2	6.30	0.62	27.5	18.2	13.0	11.2	9.75
3.4	6.70	0.70	30.7	20.3	14.5	12.5	10.9
3.6	7.09	0.78	34.2	22.6	16.1	13.9	12.1
3.8	7.49	0.87	37.7	25.0	17.8	15.4	13.4
4	7.88	0.97	41.5	27.5	19.6	16.9	14.7
4.2	8.27	1.06	45.4	30.1	21.5	18.5	16.1
4.4	8.67	1.17	49.5	32.8	23.4	20.2	17.6
4.6	9.06	1.28	53.7	35.6	25.4	21.9	19.1
4.8	9.46	1.39	58.2	38.5	27.5	23.7	20.7
5	9.85	1.51	62.7	41.5	29.6	25.5	22.3
5.2	10.20	1.62	67.4	44.6	31.8	27.5	23.9
5.4	10.60	1.75	72.3	47.9	34.2	29.5	25.7
5.6	11.00	1.88	77.3	51.2	36.5	31.5	27.5
5.8	11.40	2.02	82.5	54.6	39.0	33.6	29.3
6	11.80	2.16	87.9	58.2	41.5	35.8	31.2
6.2	12.20	2.31	93.4	61.8	44.1	38.0	33.2
6.4	12.60	2.47	99.0	65.5	46.8	40.3	35.2
6.6	13.00	2.63	105	69.4	49.5	42.7	37.2
6.8	13.40	2.79	111	73.3	52.3	45.1	39.3
7	13.80	2.96	117	77.3	55.2	47.6	41.5
7.2	14.20	3.13	123	81.5	58.2	50.1	43.7
7.4	14.60	3.31	130	85.7	61.2	52.8	46.0
7.6	15.00	3.50	136	90.0	64.3	55.4	48.3
7.8	15.40	3.69	143	94.5	67.4	58.2	50.7
8	15.80	3.88	150	99.0	70.7	60.9	53.1
8.2	16.20	4.08	157	104	74.0	63.8	55.6
8.4	16.50	4.23	164	108	77.3	66.7	58.2
8.6	16.90	4.44	171	113	80.8	69.7	60.7
8.8	17.30	4.65	178	118	84.3	72.7	63.4
9	17.70	4.87	186	123	87.9	75.8	66.1
9.2	18.10	5.09	194	128	91.5	78.9	68.8
9.4	18.50	5.32	202	133	95.2	82.1	71.6
9.6	18.90	5.55	210	139	99.0	85.4	74.4
9.8	19.30	5.79	218	144	103	88.7	77.3
10	19.70	6.03	226	150	107	92.1	80.3



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Flow of Water in Pipes

14 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.29	0.00	0.08	0.05	0.04	0.03	0.03
0.4	0.58	0.01	0.28	0.18	0.13	0.11	0.10
0.6	0.87	0.01	0.59	0.39	0.28	0.24	0.21
0.8	1.16	0.02	1.00	0.66	0.47	0.41	0.36
1	1.45	0.03	1.51	1.00	0.71	0.61	0.54
1.2	1.74	0.05	2.11	1.40	1.00	0.86	0.75
1.4	2.03	0.06	2.81	1.86	1.33	1.14	1.00
1.6	2.32	0.08	3.60	2.38	1.70	1.47	1.28
1.8	2.61	0.11	4.47	2.96	2.11	1.82	1.59
2	2.89	0.13	5.44	3.60	2.57	2.21	1.93
2.2	3.18	0.16	6.49	4.29	3.06	2.64	2.30
2.4	3.47	0.19	7.62	5.04	3.60	3.10	2.71
2.6	3.76	0.22	8.84	5.85	4.17	3.60	3.14
2.8	4.05	0.26	10.1	6.71	4.79	4.13	3.60
3	4.34	0.29	11.5	7.62	5.44	4.69	4.09
3.2	4.63	0.33	13.0	8.59	6.13	5.28	4.61
3.4	4.92	0.38	14.5	9.60	6.85	5.91	5.15
3.6	5.21	0.42	16.1	10.7	7.62	6.57	5.73
3.8	5.50	0.47	17.8	11.8	8.42	7.26	6.33
4	5.79	0.52	19.6	13.0	9.26	7.98	6.96
4.2	6.08	0.58	21.5	14.2	10.1	8.74	7.62
4.4	6.37	0.63	23.4	15.5	11.0	9.52	8.30
4.6	6.66	0.69	25.4	16.8	12.0	10.3	9.02
4.8	6.95	0.75	27.5	18.2	13.0	11.2	9.75
5	7.24	0.82	29.6	19.6	14.0	12.1	10.5
5.2	7.53	0.88	31.9	21.1	15.0	13.0	11.3
5.4	7.82	0.95	34.2	22.6	16.1	13.9	12.1
5.6	8.10	1.02	36.5	24.2	17.3	14.9	13.0
5.8	8.39	1.09	39.0	25.8	18.4	15.9	13.8
6	8.68	1.17	41.5	27.5	19.6	16.9	14.7
6.2	8.97	1.25	44.1	29.2	20.8	18.0	15.7
6.4	9.26	1.33	46.8	31.0	22.1	19.0	16.6
6.6	9.55	1.42	49.5	32.8	23.4	20.2	17.6
6.8	9.84	1.50	52.3	34.6	24.7	21.3	18.6
7	10.10	1.59	55.2	36.5	26.1	22.5	19.6
7.2	10.40	1.68	58.2	38.5	27.5	23.7	20.7
7.4	10.70	1.78	61.2	40.5	28.9	24.9	21.7
7.6	11.00	1.88	64.3	42.5	30.4	26.2	22.8
7.8	11.30	1.98	67.4	44.6	31.9	27.5	23.9
8	11.60	2.09	70.7	46.8	33.4	28.8	25.1
8.2	11.90	2.20	74.0	49.0	34.9	30.1	26.3
8.4	12.20	2.31	77.3	51.2	36.5	31.5	27.5
8.6	12.40	2.39	80.8	53.5	38.2	32.9	28.7
8.8	12.70	2.51	84.3	55.8	39.8	34.3	29.9
9	13.00	2.63	87.9	58.2	41.5	35.8	31.2
9.2	13.30	2.75	91.5	60.6	43.2	37.3	32.5
9.4	13.60	2.87	95.2	63.0	45.0	38.8	33.8
9.6	13.90	3.00	99.0	65.5	46.8	40.3	35.2
9.8	14.20	3.13	103	68.1	48.6	41.9	36.5
10	14.50	3.27	107	70.7	50.4	43.5	37.9



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Flow of Water in Pipes

16 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.55	0.00	0.22	0.15	0.10	0.09	0.08
1	1.11	0.02	0.79	0.52	0.37	0.32	0.28
1.5	1.66	0.04	1.67	1.10	0.79	0.68	0.59
2	2.22	0.08	2.84	1.88	1.34	1.16	1.01
2.5	2.77	0.12	4.29	2.84	2.03	1.75	1.52
3	3.32	0.17	6.01	3.98	2.84	2.45	2.14
3.5	3.88	0.23	8.00	5.29	3.78	3.26	2.84
4	4.43	0.31	10.2	6.77	4.84	4.17	3.64
4.5	4.99	0.39	12.7	8.42	6.01	5.18	4.52
5	5.54	0.48	15.5	10.2	7.31	6.30	5.49
5.5	6.09	0.58	18.5	12.2	8.72	7.52	6.55
6	6.65	0.69	21.7	14.3	10.2	8.83	7.70
6.5	7.20	0.81	25.1	16.6	11.9	10.2	8.93
7	7.76	0.94	28.8	19.1	13.6	11.7	10.2
7.5	8.31	1.07	32.8	21.7	15.5	13.3	11.6
8	8.86	1.22	36.9	24.4	17.4	15.0	13.1
8.5	9.42	1.38	41.3	27.3	19.5	16.8	14.7
9	9.97	1.54	45.9	30.4	21.7	18.7	16.3
9.5	10.50	1.71	50.7	33.6	24.0	20.7	18.0
10	11.10	1.91	55.8	36.9	26.3	22.7	19.8
10.5	11.60	2.09	61.0	40.4	28.8	24.9	21.7
11	12.20	2.31	66.5	44.0	31.4	27.1	23.6
11.5	12.70	2.51	72.2	47.8	34.1	29.4	25.6
12	13.30	2.75	78.1	51.7	36.9	31.8	27.7
12.5	13.90	3.00	84.3	55.8	39.8	34.3	29.9
13	14.40	3.22	90.6	60.0	42.8	36.9	32.2
13.5	15.00	3.50	97.2	64.3	45.9	39.6	34.5
14	15.50	3.73	104	68.8	49.1	42.3	36.9
14.5	16.10	4.03	111	73.4	52.4	45.2	39.4
15	16.60	4.28	118	78.1	55.8	48.1	41.9
15.5	17.20	4.60	125	83.0	59.3	51.1	44.6
16	17.70	4.87	133	88.0	62.8	54.2	47.2
16.5	18.30	5.21	141	93.2	66.5	57.4	50.0
17	18.80	5.49	149	98.5	70.3	60.6	52.9
17.5	19.40	5.85	157	104	74.2	64.0	55.8
18	19.90	6.15	165	109	78.1	67.4	58.7
18.5	20.50	6.53	174	115	82.2	70.9	61.8
19	21.10	6.92	183	121	86.4	74.5	64.9
19.5	21.60	7.25	192	127	90.6	78.1	68.1
20	22.20	7.66	201	133	95.0	81.9	71.4
20.5	22.70	8.01	210	139	99.4	85.7	74.7
21	23.30	8.44	220	146	104	89.6	78.1
21.5	23.80	8.80	230	152	109	93.6	81.6
22	24.40	9.25	240	159	113	97.7	85.2
22.5	24.90	9.64	250	165	118	102	88.8
23	25.50	10.10	260	172	123	106	92.5
23.5	26.00	10.50	271	179	128	110	96.2
24	26.60	11.00	282	186	133	115	100.
24.5	27.10	11.40	293	194	138	119	104
25	27.70	11.90	304	201	143	124	108



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Flow of Water in Pipes

18 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.44	0.00	0.12	0.08	0.06	0.05	0.04
1	0.88	0.01	0.44	0.29	0.21	0.18	0.16
1.5	1.31	0.03	0.94	0.62	0.44	0.38	0.33
2	1.75	0.05	1.60	1.06	0.76	0.65	0.57
2.5	2.19	0.07	2.42	1.60	1.14	0.99	0.86
3	2.63	0.11	3.39	2.24	1.60	1.38	1.20
3.5	3.06	0.15	4.51	2.98	2.13	1.84	1.60
4	3.50	0.19	5.77	3.82	2.73	2.35	2.05
4.5	3.94	0.24	7.18	4.75	3.39	2.92	2.55
5	4.38	0.30	8.72	5.77	4.12	3.55	3.10
5.5	4.82	0.36	10.4	6.88	4.91	4.24	3.69
6	5.25	0.43	12.2	8.09	5.77	4.98	4.34
6.5	5.69	0.50	14.2	9.38	6.69	5.77	5.03
7	6.13	0.58	16.3	10.8	7.68	6.62	5.77
7.5	6.57	0.67	18.5	12.2	8.72	7.52	6.56
8	7.00	0.76	20.8	13.8	9.83	8.47	7.39
8.5	7.44	0.86	23.3	15.4	11.0	9.48	8.27
9	7.88	0.97	25.9	17.1	12.2	10.5	9.19
9.5	8.32	1.08	28.6	18.9	13.5	11.6	10.2
10	8.76	1.19	31.4	20.8	14.8	12.8	11.2
10.5	9.19	1.31	34.4	22.8	16.3	14.0	12.2
11	9.63	1.44	37.5	24.8	17.7	15.3	13.3
11.5	10.10	1.59	40.7	26.9	19.2	16.6	14.5
12	10.50	1.71	44.1	29.2	20.8	17.9	15.6
12.5	10.90	1.85	47.5	31.4	22.4	19.4	16.9
13	11.40	2.02	51.1	33.8	24.1	20.8	18.1
13.5	11.80	2.16	54.8	36.3	25.9	22.3	19.5
14	12.30	2.35	58.6	38.8	27.7	23.9	20.8
14.5	12.70	2.51	62.5	41.4	29.5	25.5	22.2
15	13.10	2.67	66.6	44.1	31.4	27.1	23.6
15.5	13.60	2.87	70.7	46.8	33.4	28.8	25.1
16	14.00	3.05	75.0	49.6	35.4	30.6	26.6
16.5	14.40	3.22	79.4	52.5	37.5	32.3	28.2
17	14.90	3.45	83.9	55.5	39.6	34.2	29.8
17.5	15.30	3.64	88.5	58.6	41.8	36.1	31.4
18	15.80	3.88	93.3	61.7	44.1	38.0	33.1
18.5	16.20	4.08	98.1	64.9	46.3	40.0	34.8
19	16.60	4.28	103	68.2	48.7	42.0	36.6
19.5	17.10	4.54	108	71.6	51.1	44.1	38.4
20	17.50	4.76	113	75.0	53.5	46.2	40.3
20.5	17.90	4.98	119	78.5	56.0	48.3	42.1
21	18.40	5.26	124	82.1	58.6	50.5	44.1
21.5	18.80	5.49	130	85.7	61.2	52.8	46.0
22	19.30	5.79	135	89.5	63.9	55.1	48.0
22.5	19.70	6.03	141	93.3	66.6	57.4	50.0
23	20.10	6.28	147	97.1	69.3	59.8	52.1
23.5	20.60	6.60	153	101	72.1	62.2	54.2
24	21.00	6.85	159	105	75.0	64.7	56.4
24.5	21.50	7.18	165	109	77.9	67.2	58.6
25	21.90	7.45	171	113	80.9	69.8	60.8



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Flow of Water in Pipes

20 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.36	0.00	0.07	0.05	0.03	0.03	0.03
1	0.71	0.01	0.27	0.18	0.13	0.11	0.09
1.5	1.06	0.02	0.56	0.37	0.27	0.23	0.20
2	1.42	0.03	0.96	0.64	0.45	0.39	0.34
2.5	1.77	0.05	1.45	0.96	0.68	0.59	0.52
3	2.13	0.07	2.03	1.34	0.96	0.83	0.72
3.5	2.48	0.10	2.70	1.79	1.28	1.10	0.96
4	2.84	0.13	3.46	2.29	1.63	1.41	1.23
4.5	3.19	0.16	4.30	2.84	2.03	1.75	1.53
5	3.55	0.20	5.22	3.46	2.47	2.13	1.85
5.5	3.90	0.24	6.23	4.12	2.94	2.54	2.21
6	4.26	0.28	7.32	4.84	3.46	2.98	2.60
6.5	4.61	0.33	8.49	5.62	4.01	3.46	3.01
7	4.96	0.38	9.73	6.44	4.60	3.96	3.46
7.5	5.32	0.44	11.1	7.32	5.22	4.50	3.93
8	5.67	0.50	12.5	8.25	5.89	5.08	4.43
8.5	6.03	0.57	13.9	9.23	6.58	5.68	4.95
9	6.38	0.63	15.5	10.3	7.32	6.31	5.50
9.5	6.74	0.71	17.1	11.3	8.09	6.98	6.08
10	7.09	0.78	18.8	12.5	8.89	7.67	6.69
10.5	7.45	0.86	20.6	13.6	9.73	8.39	7.32
11	7.80	0.95	22.5	14.9	10.6	9.15	7.98
11.5	8.16	1.03	24.4	16.1	11.5	9.93	8.66
12	8.51	1.13	26.4	17.5	12.5	10.7	9.37
12.5	8.86	1.22	28.5	18.8	13.4	11.6	10.1
13	9.22	1.32	30.6	20.2	14.5	12.5	10.9
13.5	9.57	1.42	32.8	21.7	15.5	13.4	11.7
14	9.93	1.53	35.1	23.2	16.6	14.3	12.5
14.5	10.30	1.65	37.4	24.8	17.7	15.3	13.3
15	10.60	1.75	39.9	26.4	18.8	16.2	14.2
15.5	11.00	1.88	42.4	28.0	20.0	17.3	15.0
16	11.30	1.98	44.9	29.7	21.2	18.3	16.0
16.5	11.70	2.13	47.6	31.5	22.5	19.4	16.9
17	12.10	2.28	50.3	33.3	23.7	20.5	17.8
17.5	12.40	2.39	53.0	35.1	25.0	21.6	18.8
18	12.80	2.55	55.9	37.0	26.4	22.8	19.8
18.5	13.10	2.67	58.8	38.9	27.8	23.9	20.9
19	13.50	2.83	61.7	40.9	29.2	25.1	21.9
19.5	13.80	2.96	64.8	42.9	30.6	26.4	23.0
20	14.20	3.13	67.9	44.9	32.1	27.6	24.1
20.5	14.50	3.27	71.1	47.0	33.6	28.9	25.2
21	14.90	3.45	74.3	49.2	35.1	30.3	26.4
21.5	15.20	3.59	77.6	51.4	36.7	31.6	27.6
22	15.60	3.78	81.0	53.6	38.2	33.0	28.8
22.5	16.00	3.98	84.4	55.9	39.9	34.4	30.0
23	16.30	4.13	87.9	58.2	41.5	35.8	31.2
23.5	16.70	4.33	91.5	60.5	43.2	37.3	32.5
24	17.00	4.49	95.1	62.9	44.9	38.7	33.8
24.5	17.40	4.71	98.8	65.4	46.7	40.2	35.1
25	17.70	4.87	103	67.9	48.4	41.8	36.4



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Flow of Water in Pipes

24 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.25	0.00	0.03	0.02	0.01	0.01	0.01
1	0.49	0.00	0.11	0.07	0.05	0.04	0.04
1.5	0.74	0.01	0.23	0.15	0.11	0.09	0.08
2	0.99	0.02	0.40	0.26	0.19	0.16	0.14
2.5	1.23	0.02	0.60	0.40	0.28	0.24	0.21
3	1.48	0.03	0.84	0.55	0.40	0.34	0.30
3.5	1.72	0.05	1.11	0.74	0.53	0.45	0.40
4	1.97	0.06	1.42	0.94	0.67	0.58	0.51
4.5	2.22	0.08	1.77	1.17	0.84	0.72	0.63
5	2.46	0.09	2.15	1.42	1.02	0.88	0.76
5.5	2.71	0.11	2.57	1.70	1.21	1.05	0.91
6	2.95	0.14	3.01	1.99	1.42	1.23	1.07
6.5	3.20	0.16	3.50	2.31	1.65	1.42	1.24
7	3.45	0.19	4.01	2.65	1.89	1.63	1.42
7.5	3.69	0.21	4.55	3.01	2.15	1.86	1.62
8	3.94	0.24	5.13	3.40	2.42	2.09	1.82
8.5	4.19	0.27	5.74	3.80	2.71	2.34	2.04
9	4.43	0.31	6.38	4.22	3.01	2.60	2.27
9.5	4.68	0.34	7.05	4.67	3.33	2.87	2.50
10	4.92	0.38	7.76	5.13	3.66	3.16	2.75
10.5	5.17	0.42	8.49	5.62	4.01	3.46	3.01
11	5.42	0.46	9.25	6.12	4.37	3.77	3.29
11.5	5.66	0.50	10.	6.65	4.74	4.09	3.57
12	5.91	0.54	10.9	7.19	5.13	4.43	3.86
12.5	6.16	0.59	11.7	7.76	5.53	4.77	4.16
13	6.40	0.64	12.6	8.34	5.95	5.13	4.47
13.5	6.65	0.69	13.5	8.94	6.38	5.50	4.80
14	6.89	0.74	14.5	9.56	6.83	5.89	5.13
14.5	7.14	0.79	15.4	10.2	7.28	6.28	5.48
15	7.39	0.85	16.4	10.9	7.76	6.69	5.83
15.5	7.63	0.91	17.4	11.5	8.24	7.11	6.20
16	7.88	0.97	18.5	12.2	8.74	7.54	6.57
16.5	8.13	1.03	19.6	13.0	9.25	7.98	6.96
17	8.37	1.09	20.7	13.7	9.78	8.43	7.35
17.5	8.62	1.15	21.8	14.5	10.3	8.89	7.76
18	8.86	1.22	23.0	15.2	10.9	9.37	8.17
18.5	9.11	1.29	24.2	16.0	11.4	9.86	8.59
19	9.36	1.36	25.4	16.8	12.0	10.4	9.03
19.5	9.60	1.43	26.7	17.7	12.6	10.9	9.47
20	9.85	1.51	28.0	18.5	13.2	11.4	9.93
20.5	10.10	1.59	29.3	19.4	13.8	11.9	10.4
21	10.30	1.65	30.6	20.2	14.5	12.5	10.9
21.5	10.60	1.75	32.0	21.2	15.1	13.0	11.3
22	10.80	1.81	33.3	22.1	15.8	13.6	11.8
22.5	11.10	1.91	34.8	23.0	16.4	14.2	12.3
23	11.30	1.98	36.2	24.0	17.1	14.7	12.9
23.5	11.60	2.09	37.7	24.9	17.8	15.3	13.4
24	11.80	2.16	39.2	25.9	18.5	16.0	13.9
24.5	12.10	2.28	40.7	26.9	19.2	16.6	14.5
25	12.30	2.35	42.2	28.0	20.0	17.2	15.0



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Flow of Water in Pipes

30 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1	0.32	0.00	0.04	0.02	0.02	0.02	0.01
2	0.63	0.01	0.13	0.09	0.06	0.05	0.05
3	0.95	0.01	0.28	0.19	0.13	0.12	0.10
4	1.26	0.02	0.48	0.32	0.23	0.20	0.17
5	1.58	0.04	0.73	0.48	0.34	0.30	0.26
6	1.89	0.06	1.02	0.67	0.48	0.42	0.36
7	2.21	0.08	1.35	0.90	0.64	0.55	0.48
8	2.52	0.10	1.73	1.15	0.82	0.71	0.62
9	2.84	0.13	2.15	1.43	1.02	0.88	0.77
10	3.15	0.15	2.62	1.73	1.24	1.07	0.93
11	3.47	0.19	3.12	2.07	1.48	1.27	1.11
12	3.78	0.22	3.67	2.43	1.73	1.49	1.30
13	4.10	0.26	4.25	2.82	2.01	1.73	1.51
14	4.41	0.30	4.88	3.23	2.30	1.99	1.73
15	4.73	0.35	5.54	3.67	2.62	2.26	1.97
16	5.04	0.40	6.25	4.13	2.95	2.54	2.22
17	5.36	0.45	6.99	4.63	3.30	2.85	2.48
18	5.67	0.50	7.77	5.14	3.67	3.16	2.76
19	5.99	0.56	8.59	5.68	4.06	3.50	3.05
20	6.30	0.62	9.44	6.25	4.46	3.85	3.35
21	6.62	0.68	10.3	6.84	4.88	4.21	3.67
22	6.93	0.75	11.3	7.45	5.32	4.59	4.00
23	7.25	0.82	12.2	8.09	5.77	4.98	4.34
24	7.56	0.89	13.2	8.75	6.25	5.39	4.70
25	7.88	0.97	14.3	9.44	6.74	5.81	5.07
26	8.20	1.05	15.3	10.2	7.24	6.25	5.45
27	8.51	1.13	16.4	10.9	7.77	6.70	5.84
28	8.83	1.21	17.6	11.6	8.31	7.17	6.25
29	9.14	1.30	18.8	12.4	8.87	7.65	6.67
30	9.46	1.39	20.0	13.2	9.44	8.14	7.10
31	9.77	1.48	21.2	14.1	10.	8.65	7.54
32	10.10	1.59	22.5	14.9	10.6	9.17	8.00
33	10.40	1.68	23.8	15.8	11.3	9.71	8.47
34	10.70	1.78	25.2	16.7	11.9	10.3	8.95
35	11.00	1.88	26.6	17.6	12.6	10.8	9.44
36	11.30	1.98	28.0	18.5	13.2	11.4	9.95
37	11.70	2.13	29.5	19.5	13.9	12.0	10.5
38	12.00	2.24	31.0	20.5	14.6	12.6	11.0
39	12.30	2.35	32.5	21.5	15.3	13.2	11.5
40	12.60	2.47	34.0	22.5	16.1	13.9	12.1
41	12.90	2.59	35.6	23.6	16.8	14.5	12.7
42	13.20	2.71	37.2	24.6	17.6	15.2	13.2
43	13.60	2.87	38.9	25.7	18.4	15.8	13.8
44	13.90	3.00	40.6	26.9	19.2	16.5	14.4
45	14.20	3.13	42.3	28.0	20.0	17.2	15.0
46	14.50	3.27	44.1	29.2	20.8	18.0	15.7
47	14.80	3.40	45.9	30.4	21.7	18.7	16.3
48	15.10	3.54	47.7	31.6	22.5	19.4	16.9
49	15.40	3.69	49.5	32.8	23.4	20.2	17.6
50	15.80	3.88	51.4	34.0	24.3	20.9	18.3



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Flow of Water in Pipes

36 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.44	0.00	0.05	0.04	0.03	0.02	0.02
4	0.88	0.01	0.20	0.13	0.09	0.08	0.07
6	1.31	0.03	0.42	0.28	0.20	0.17	0.15
8	1.75	0.05	0.71	0.47	0.34	0.29	0.25
10	2.19	0.07	1.08	0.71	0.51	0.44	0.38
12	2.63	0.11	1.51	1.00	0.71	0.62	0.54
14	3.06	0.15	2.01	1.33	0.95	0.82	0.71
16	3.50	0.19	2.57	1.70	1.22	1.05	0.91
18	3.94	0.24	3.20	2.12	1.51	1.30	1.14
20	4.38	0.30	3.89	2.57	1.84	1.58	1.38
22	4.82	0.36	4.64	3.07	2.19	1.89	1.65
24	5.25	0.43	5.45	3.61	2.57	2.22	1.93
26	5.69	0.50	6.32	4.18	2.98	2.57	2.24
28	6.13	0.58	7.25	4.79	3.42	2.95	2.57
30	6.57	0.67	8.23	5.45	3.89	3.35	2.92
32	7.00	0.76	9.28	6.14	4.38	3.78	3.29
34	7.44	0.86	10.4	6.87	4.90	4.23	3.69
36	7.88	0.97	11.5	7.63	5.45	4.70	4.10
38	8.32	1.08	12.7	8.44	6.02	5.19	4.53
40	8.76	1.19	14.0	9.28	6.62	5.71	4.98
42	9.19	1.31	15.3	10.2	7.25	6.25	5.45
44	9.63	1.44	16.7	11.1	7.90	6.81	5.94
46	10.10	1.59	18.2	12.0	8.57	7.39	6.45
48	10.50	1.71	19.6	13.0	9.28	8.00	6.97
50	10.90	1.85	21.2	14.0	10.	8.63	7.52
52	11.40	2.02	22.8	15.1	10.8	9.28	8.09
54	11.80	2.16	24.4	16.2	11.5	9.95	8.67
56	12.30	2.35	26.1	17.3	12.3	10.6	9.28
58	12.70	2.51	27.9	18.4	13.2	11.4	9.90
60	13.10	2.67	29.7	19.6	14.0	12.1	10.5
62	13.60	2.87	31.5	20.9	14.9	12.8	11.2
64	14.00	3.05	33.4	22.1	15.8	13.6	11.9
66	14.40	3.22	35.4	23.4	16.7	14.4	12.6
68	14.90	3.45	37.4	24.8	17.7	15.2	13.3
70	15.30	3.64	39.5	26.1	18.6	16.1	14.0
72	15.80	3.88	41.6	27.5	19.6	16.9	14.8
74	16.20	4.08	43.7	28.9	20.7	17.8	15.5
76	16.60	4.28	46.0	30.4	21.7	18.7	16.3
78	17.10	4.54	48.2	31.9	22.8	19.6	17.1
80	17.50	4.76	50.5	33.4	23.9	20.6	17.9
82	17.90	4.98	52.9	35.0	25.0	21.5	18.8
84	18.40	5.26	55.3	36.6	26.1	22.5	19.6
86	18.80	5.49	57.8	38.2	27.3	23.5	20.5
88	19.30	5.79	60.3	39.9	28.5	24.5	21.4
90	19.70	6.03	62.8	41.6	29.7	25.6	22.3
92	20.10	6.28	65.4	43.3	30.9	26.7	23.2
94	20.60	6.60	68.1	45.1	32.2	27.7	24.2
96	21.00	6.85	70.8	46.9	33.4	28.8	25.1
98	21.50	7.18	73.6	48.7	34.7	30.0	26.1
100	21.90	7.45	76.4	50.5	36.1	31.1	27.1



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Durango, CO 81301
(970) 259-7411

Flow of Water in Pipes

42 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.32	0.00	0.03	0.02	0.01	0.01	0.01
4	0.64	0.01	0.09	0.06	0.04	0.04	0.03
6	0.97	0.01	0.20	0.13	0.09	0.08	0.07
8	1.29	0.03	0.34	0.22	0.16	0.14	0.12
10	1.61	0.04	0.51	0.34	0.24	0.21	0.18
12	1.93	0.06	0.71	0.47	0.34	0.29	0.25
14	2.25	0.08	0.95	0.63	0.45	0.39	0.34
16	2.57	0.10	1.22	0.80	0.57	0.50	0.43
18	2.89	0.13	1.51	1.00	0.71	0.62	0.54
20	3.22	0.16	1.84	1.22	0.87	0.75	0.65
22	3.54	0.20	2.19	1.45	1.03	0.89	0.78
24	3.86	0.23	2.57	1.70	1.22	1.05	0.91
26	4.18	0.27	2.98	1.97	1.41	1.22	1.06
28	4.50	0.32	3.42	2.26	1.62	1.39	1.22
30	4.82	0.36	3.89	2.57	1.84	1.58	1.38
32	5.15	0.41	4.38	2.90	2.07	1.78	1.56
34	5.47	0.47	4.90	3.24	2.32	2.00	1.74
36	5.79	0.52	5.45	3.61	2.57	2.22	1.93
38	6.11	0.58	6.02	3.98	2.84	2.45	2.14
40	6.43	0.64	6.62	4.38	3.13	2.70	2.35
42	6.75	0.71	7.25	4.80	3.42	2.95	2.57
44	7.08	0.78	7.90	5.23	3.73	3.22	2.80
46	7.40	0.85	8.57	5.67	4.05	3.49	3.04
48	7.72	0.93	9.28	6.14	4.38	3.78	3.29
50	8.04	1.00	10.	6.62	4.73	4.07	3.55
52	8.36	1.09	10.8	7.12	5.08	4.38	3.82
54	8.68	1.17	11.5	7.63	5.45	4.70	4.10
56	9.01	1.26	12.3	8.17	5.83	5.03	4.38
58	9.33	1.35	13.2	8.71	6.22	5.36	4.68
60	9.65	1.45	14.0	9.28	6.62	5.71	4.98
62	9.97	1.54	14.9	9.86	7.03	6.07	5.29
64	10.30	1.65	15.8	10.5	7.46	6.43	5.61
66	10.60	1.75	16.7	11.1	7.90	6.81	5.94
68	10.90	1.85	17.7	11.7	8.35	7.20	6.28
70	11.30	1.98	18.6	12.3	8.81	7.59	6.62
72	11.60	2.09	19.6	13.0	9.28	8.00	6.97
74	11.90	2.20	20.7	13.7	9.76	8.42	7.34
76	12.20	2.31	21.7	14.4	10.3	8.84	7.71
78	12.50	2.43	22.8	15.1	10.8	9.28	8.09
80	12.90	2.59	23.9	15.8	11.3	9.72	8.48
82	13.20	2.71	25.0	16.5	11.8	10.2	8.87
84	13.50	2.83	26.1	17.3	12.3	10.6	9.28
86	13.80	2.96	27.3	18.1	12.9	11.1	9.69
88	14.20	3.13	28.5	18.8	13.4	11.6	10.1
90	14.50	3.27	29.7	19.6	14.0	12.1	10.5
92	14.80	3.40	30.9	20.5	14.6	12.6	11.0
94	15.10	3.54	32.2	21.3	15.2	13.1	11.4
96	15.40	3.69	33.4	22.1	15.8	13.6	11.9
98	15.80	3.88	34.7	23.0	16.4	14.2	12.3
100	16.10	4.03	36.1	23.9	17.0	14.7	12.8



Wright Water Engineers, Inc.

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Durango, CO 81301
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Flow of Water in Pipes

48 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.25	0.00	0.01	0.01	0.01	0.01	0.00
4	0.49	0.00	0.05	0.03	0.02	0.02	0.02
6	0.74	0.01	0.10	0.07	0.05	0.04	0.04
8	0.99	0.02	0.18	0.12	0.08	0.07	0.06
10	1.23	0.02	0.27	0.18	0.13	0.11	0.09
12	1.48	0.03	0.37	0.25	0.18	0.15	0.13
14	1.72	0.05	0.50	0.33	0.23	0.20	0.18
16	1.97	0.06	0.64	0.42	0.30	0.26	0.23
18	2.22	0.08	0.79	0.52	0.37	0.32	0.28
20	2.46	0.09	0.96	0.64	0.45	0.39	0.34
22	2.71	0.11	1.14	0.76	0.54	0.47	0.41
24	2.95	0.14	1.34	0.89	0.64	0.55	0.48
26	3.20	0.16	1.56	1.03	0.74	0.64	0.55
28	3.45	0.19	1.79	1.18	0.84	0.73	0.64
30	3.69	0.21	2.03	1.34	0.96	0.83	0.72
32	3.94	0.24	2.29	1.51	1.08	0.93	0.81
34	4.19	0.27	2.56	1.69	1.21	1.04	0.91
36	4.43	0.31	2.85	1.88	1.34	1.16	1.01
38	4.68	0.34	3.14	2.08	1.49	1.28	1.12
40	4.92	0.38	3.46	2.29	1.63	1.41	1.23
42	5.17	0.42	3.78	2.50	1.79	1.54	1.34
44	5.42	0.46	4.12	2.73	1.95	1.68	1.46
46	5.66	0.50	4.48	2.96	2.11	1.82	1.59
48	5.91	0.54	4.84	3.21	2.29	1.97	1.72
50	6.16	0.59	5.22	3.46	2.47	2.13	1.86
52	6.40	0.64	5.62	3.72	2.65	2.29	1.99
54	6.65	0.69	6.02	3.99	2.85	2.45	2.14
56	6.89	0.74	6.44	4.26	3.04	2.62	2.29
58	7.14	0.79	6.88	4.55	3.25	2.80	2.44
60	7.39	0.85	7.32	4.84	3.46	2.98	2.60
62	7.63	0.91	7.78	5.15	3.67	3.17	2.76
64	7.88	0.97	8.25	5.46	3.90	3.36	2.93
66	8.13	1.03	8.73	5.78	4.12	3.56	3.10
68	8.37	1.09	9.23	6.11	4.36	3.76	3.28
70	8.62	1.15	9.74	6.44	4.60	3.97	3.46
72	8.86	1.22	10.3	6.79	4.84	4.18	3.64
74	9.11	1.29	10.8	7.14	5.10	4.39	3.83
76	9.36	1.36	11.3	7.50	5.35	4.62	4.03
78	9.60	1.43	11.9	7.87	5.62	4.84	4.22
80	9.85	1.51	12.5	8.25	5.89	5.08	4.43
82	10.10	1.59	13.0	8.63	6.16	5.31	4.63
84	10.30	1.65	13.6	9.03	6.44	5.56	4.84
86	10.60	1.75	14.2	9.43	6.73	5.80	5.06
88	10.80	1.81	14.9	9.84	7.02	6.06	5.28
90	11.10	1.91	15.5	10.3	7.32	6.31	5.50
92	11.30	1.98	16.1	10.7	7.62	6.57	5.73
94	11.60	2.09	16.8	11.1	7.93	6.84	5.96
96	11.80	2.16	17.5	11.6	8.25	7.11	6.20
98	12.10	2.28	18.1	12.0	8.57	7.39	6.44
100	12.30	2.35	18.8	12.5	8.90	7.67	6.69



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Flow of Water in Pipes

54 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
5	0.49	0.00	0.04	0.03	0.02	0.02	0.01
10	0.97	0.01	0.15	0.10	0.07	0.06	0.05
15	1.46	0.03	0.32	0.21	0.15	0.13	0.11
20	1.95	0.06	0.54	0.36	0.26	0.22	0.19
25	2.43	0.09	0.82	0.54	0.39	0.33	0.29
30	2.92	0.13	1.14	0.76	0.54	0.47	0.41
35	3.40	0.18	1.52	1.01	0.72	0.62	0.54
40	3.89	0.24	1.95	1.29	0.92	0.79	0.69
45	4.38	0.30	2.42	1.60	1.14	0.99	0.86
50	4.86	0.37	2.95	1.95	1.39	1.20	1.05
55	5.35	0.45	3.51	2.33	1.66	1.43	1.25
60	5.84	0.53	4.13	2.73	1.95	1.68	1.47
65	6.32	0.62	4.79	3.17	2.26	1.95	1.70
70	6.81	0.72	5.49	3.63	2.59	2.24	1.95
75	7.30	0.83	6.24	4.13	2.95	2.54	2.21
80	7.78	0.94	7.03	4.65	3.32	2.86	2.50
85	8.27	1.06	7.86	5.20	3.71	3.20	2.79
90	8.76	1.19	8.74	5.78	4.13	3.56	3.10
95	9.24	1.33	9.66	6.39	4.56	3.93	3.43
100	9.73	1.47	10.6	7.03	5.02	4.32	3.77
105	10.20	1.62	11.6	7.69	5.49	4.73	4.13
110	10.70	1.78	12.7	8.38	5.98	5.16	4.50
115	11.20	1.95	13.8	9.10	6.49	5.60	4.88
120	11.70	2.13	14.9	9.85	7.03	6.06	5.28
125	12.20	2.31	16.0	10.6	7.58	6.54	5.70
130	12.60	2.47	17.3	11.4	8.15	7.03	6.13
135	13.10	2.67	18.5	12.2	8.74	7.54	6.57
140	13.60	2.87	19.8	13.1	9.35	8.06	7.03
145	14.10	3.09	21.1	14.0	9.97	8.60	7.50
150	14.60	3.31	22.5	14.9	10.6	9.16	7.98
155	15.10	3.54	23.9	15.8	11.3	9.73	8.48
160	15.60	3.78	25.3	16.8	12.0	10.3	9.00
165	16.10	4.03	26.8	17.7	12.7	10.9	9.52
170	16.50	4.23	28.3	18.8	13.4	11.5	10.1
175	17.00	4.49	29.9	19.8	14.1	12.2	10.6
180	17.50	4.76	31.5	20.8	14.9	12.8	11.2
185	18.00	5.04	33.1	21.9	15.7	13.5	11.8
190	18.50	5.32	34.8	23.0	16.4	14.2	12.4
195	19.00	5.61	36.5	24.2	17.3	14.9	13.0
200	19.50	5.91	38.3	25.3	18.1	15.6	13.6
205	19.90	6.15	40.1	26.5	18.9	16.3	14.2
210	20.40	6.47	41.9	27.7	19.8	17.1	14.9
215	20.90	6.79	43.8	29.0	20.7	17.8	15.5
220	21.40	7.12	45.7	30.2	21.6	18.6	16.2
225	21.90	7.45	47.6	31.5	22.5	19.4	16.9
230	22.40	7.80	49.6	32.8	23.4	20.2	17.6
235	22.90	8.15	51.6	34.1	24.4	21.0	18.3
240	23.30	8.44	53.6	35.5	25.3	21.8	19.0
245	23.80	8.80	55.7	36.9	26.3	22.7	19.8
250	24.30	9.18	57.8	38.3	27.3	23.6	20.5



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Flow of Water in Pipes

60 Inch Diameter Pipe							
Flow MGD	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
5	0.39	0.00	0.02	0.02	0.01	0.01	0.01
10	0.79	0.01	0.09	0.06	0.04	0.04	0.03
15	1.18	0.02	0.19	0.13	0.09	0.08	0.07
20	1.58	0.04	0.32	0.21	0.15	0.13	0.12
25	1.97	0.06	0.49	0.32	0.23	0.20	0.17
30	2.36	0.09	0.69	0.45	0.32	0.28	0.24
35	2.76	0.12	0.91	0.60	0.43	0.37	0.32
40	3.15	0.15	1.17	0.77	0.55	0.48	0.42
45	3.55	0.20	1.45	0.96	0.69	0.59	0.52
50	3.94	0.24	1.76	1.17	0.83	0.72	0.63
55	4.33	0.29	2.10	1.39	0.99	0.86	0.75
60	4.73	0.35	2.47	1.64	1.17	1.01	0.88
65	5.12	0.41	2.87	1.90	1.35	1.17	1.02
70	5.52	0.47	3.29	2.18	1.55	1.34	1.17
75	5.91	0.54	3.73	2.47	1.76	1.52	1.33
80	6.30	0.62	4.21	2.79	1.99	1.71	1.49
85	6.70	0.70	4.71	3.12	2.22	1.92	1.67
90	7.09	0.78	5.23	3.46	2.47	2.13	1.86
95	7.49	0.87	5.78	3.83	2.73	2.36	2.05
100	7.88	0.97	6.36	4.21	3.00	2.59	2.26
105	8.27	1.06	6.96	4.61	3.29	2.83	2.47
110	8.67	1.17	7.59	5.02	3.58	3.09	2.69
115	9.06	1.28	8.24	5.45	3.89	3.35	2.92
120	9.46	1.39	8.91	5.90	4.21	3.63	3.16
125	9.85	1.51	9.61	6.36	4.54	3.91	3.41
130	10.20	1.62	10.3	6.84	4.88	4.21	3.67
135	10.60	1.75	11.1	7.33	5.23	4.51	3.93
140	11.00	1.88	11.9	7.84	5.60	4.83	4.21
145	11.40	2.02	12.6	8.37	5.97	5.15	4.49
150	11.80	2.16	13.5	8.91	6.36	5.48	4.78
155	12.20	2.31	14.3	9.47	6.76	5.83	5.08
160	12.60	2.47	15.2	10.	7.17	6.18	5.39
165	13.00	2.63	16.1	10.6	7.59	6.54	5.70
170	13.40	2.79	17.0	11.2	8.02	6.91	6.03
175	13.80	2.96	17.9	11.9	8.46	7.29	6.36
180	14.20	3.13	18.9	12.5	8.91	7.68	6.70
185	14.60	3.31	19.8	13.1	9.37	8.08	7.05
190	15.00	3.50	20.9	13.8	9.85	8.49	7.40
195	15.40	3.69	21.9	14.5	10.3	8.91	7.77
200	15.80	3.88	22.9	15.2	10.8	9.34	8.14
205	16.20	4.08	24.0	15.9	11.3	9.77	8.52
210	16.50	4.23	25.1	16.6	11.9	10.2	8.91
215	16.90	4.44	26.2	17.3	12.4	10.7	9.31
220	17.30	4.65	27.3	18.1	12.9	11.1	9.71
225	17.70	4.87	28.5	18.9	13.5	11.6	10.1
230	18.10	5.09	29.7	19.6	14.0	12.1	10.5
235	18.50	5.32	30.9	20.4	14.6	12.6	11.0
240	18.90	5.55	32.1	21.3	15.2	13.1	11.4
245	19.30	5.79	33.4	22.1	15.8	13.6	11.9
250	19.70	6.03	34.6	22.9	16.4	14.1	12.3



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CFS

Flow of Water in Pipes

6 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.05	0.26	0.00	0.16	0.11	0.08	0.07	0.06
0.1	0.51	0.00	0.59	0.39	0.28	0.24	0.21
0.15	0.76	0.01	1.24	0.82	0.59	0.51	0.44
0.2	1.02	0.02	2.11	1.40	1.00	0.86	0.75
0.25	1.27	0.03	3.19	2.11	1.51	1.30	1.13
0.3	1.53	0.04	4.48	2.96	2.11	1.82	1.59
0.35	1.78	0.05	5.95	3.94	2.81	2.42	2.11
0.4	2.04	0.06	7.62	5.04	3.60	3.10	2.71
0.45	2.29	0.08	9.48	6.27	4.48	3.86	3.37
0.5	2.55	0.10	11.5	7.62	5.44	4.69	4.09
0.55	2.80	0.12	13.7	9.09	6.49	5.59	4.88
0.6	3.06	0.15	16.1	10.7	7.62	6.57	5.73
0.65	3.31	0.17	18.7	12.4	8.84	7.62	6.64
0.7	3.57	0.20	21.5	14.2	10.1	8.74	7.62
0.75	3.82	0.23	24.4	16.1	11.5	9.93	8.66
0.8	4.07	0.26	27.5	18.2	13.0	11.2	9.76
0.85	4.33	0.29	30.7	20.3	14.5	12.5	10.9
0.9	4.58	0.33	34.2	22.6	16.1	13.9	12.1
0.95	4.84	0.36	37.8	25.0	17.8	15.4	13.4
1	5.09	0.40	41.5	27.5	19.6	16.9	14.7
1.05	5.35	0.45	45.4	30.1	21.5	18.5	16.1
1.1	5.60	0.49	49.5	32.8	23.4	20.2	17.6
1.15	5.86	0.53	53.8	35.6	25.4	21.9	19.1
1.2	6.11	0.58	58.2	38.5	27.5	23.7	20.7
1.25	6.37	0.63	62.7	41.5	29.6	25.6	22.3
1.3	6.62	0.68	67.5	44.6	31.9	27.5	24.0
1.35	6.88	0.74	72.3	47.9	34.2	29.5	25.7
1.4	7.13	0.79	77.4	51.2	36.5	31.5	27.5
1.45	7.38	0.85	82.6	54.6	39.0	33.6	29.3
1.5	7.64	0.91	87.9	58.2	41.5	35.8	31.2
1.55	7.89	0.97	93.4	61.8	44.1	38.0	33.2
1.6	8.15	1.03	99.0	65.5	46.8	40.3	35.2
1.65	8.40	1.10	105	69.4	49.5	42.7	37.2
1.7	8.66	1.17	111	73.3	52.3	45.1	39.3
1.75	8.91	1.23	117	77.4	55.2	47.6	41.5
1.8	9.17	1.31	123	81.5	58.2	50.2	43.7
1.85	9.42	1.38	130	85.7	61.2	52.8	46.0
1.9	9.68	1.46	136	90.1	64.3	55.4	48.3
1.95	9.93	1.53	143	94.5	67.5	58.2	50.7
2	10.20	1.62	150	99.0	70.7	61.0	53.1
2.05	10.40	1.68	157	104	74.0	63.8	55.6
2.1	10.70	1.78	164	108	77.4	66.7	58.2
2.15	10.90	1.85	171	113	80.8	69.7	60.8
2.2	11.20	1.95	179	118	84.3	72.7	63.4
2.25	11.50	2.06	186	123	87.9	75.8	66.1
2.3	11.70	2.13	194	128	91.5	78.9	68.8
2.35	12.00	2.24	202	133	95.3	82.1	71.6
2.4	12.20	2.31	210	139	99.0	85.4	74.5
2.45	12.50	2.43	218	144	103	88.7	77.4
2.5	12.70	2.51	226	150	107	92.1	80.3



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(970) 259-7411

Flow of Water in Pipes

8 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.29	0.00	0.15	0.10	0.07	0.06	0.05
0.2	0.57	0.01	0.52	0.35	0.25	0.21	0.19
0.3	0.86	0.01	1.10	0.73	0.52	0.45	0.39
0.4	1.15	0.02	1.88	1.24	0.89	0.77	0.67
0.5	1.43	0.03	2.84	1.88	1.34	1.16	1.01
0.6	1.72	0.05	3.98	2.63	1.88	1.62	1.41
0.7	2.01	0.06	5.29	3.50	2.50	2.16	1.88
0.8	2.29	0.08	6.78	4.48	3.20	2.76	2.41
0.9	2.58	0.10	8.43	5.58	3.98	3.43	2.99
1	2.86	0.13	10.2	6.78	4.84	4.17	3.64
1.1	3.15	0.15	12.2	8.08	5.77	4.98	4.34
1.2	3.44	0.18	14.3	9.50	6.78	5.84	5.10
1.3	3.72	0.22	16.6	11.0	7.86	6.78	5.91
1.4	4.01	0.25	19.1	12.6	9.01	7.77	6.78
1.5	4.30	0.29	21.7	14.3	10.2	8.83	7.70
1.6	4.58	0.33	24.4	16.2	11.5	9.95	8.68
1.7	4.87	0.37	27.3	18.1	12.9	11.1	9.71
1.8	5.16	0.41	30.4	20.1	14.3	12.4	10.8
1.9	5.44	0.46	33.6	22.2	15.9	13.7	11.9
2	5.73	0.51	36.9	24.4	17.4	15.0	13.1
2.1	6.02	0.56	40.4	26.7	19.1	16.5	14.3
2.2	6.30	0.62	44.0	29.1	20.8	17.9	15.6
2.3	6.59	0.68	47.8	31.6	22.6	19.5	17.0
2.4	6.88	0.74	51.7	34.2	24.4	21.1	18.4
2.5	7.16	0.80	55.8	36.9	26.3	22.7	19.8
2.6	7.45	0.86	60.0	39.7	28.3	24.4	21.3
2.7	7.73	0.93	64.3	42.6	30.4	26.2	22.8
2.8	8.02	1.00	68.8	45.5	32.5	28.0	24.4
2.9	8.31	1.07	73.4	48.6	34.7	29.9	26.1
3	8.59	1.15	78.2	51.7	36.9	31.8	27.8
3.1	8.88	1.23	83.0	55.0	39.2	33.8	29.5
3.2	9.17	1.31	88.1	58.3	41.6	35.9	31.3
3.3	9.45	1.39	93.2	61.7	44.0	38.0	33.1
3.4	9.74	1.47	98.5	65.2	46.5	40.1	35.0
3.5	10.00	1.55	104	68.8	49.1	42.3	36.9
3.6	10.30	1.65	110	72.5	51.7	44.6	38.9
3.7	10.60	1.75	115	76.2	54.4	46.9	40.9
3.8	10.90	1.85	121	80.1	57.2	49.3	43.0
3.9	11.20	1.95	127	84.0	60.0	51.7	45.1
4	11.50	2.06	133	88.1	62.9	54.2	47.3
4.1	11.70	2.13	139	92.2	65.8	56.7	49.5
4.2	12.00	2.24	146	96.4	68.8	59.3	51.7
4.3	12.30	2.35	152	101	71.9	62.0	54.0
4.4	12.60	2.47	159	105	75.0	64.7	56.4
4.5	12.90	2.59	165	110	78.2	67.4	58.8
4.6	13.20	2.71	172	114	81.4	70.2	61.2
4.7	13.50	2.83	179	119	84.7	73.0	63.7
4.8	13.80	2.96	186	123	88.1	75.9	66.2
4.9	14.00	3.05	194	128	91.5	78.9	68.8
5	14.30	3.18	201	133	95.0	81.9	71.4



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Flow of Water in Pipes

10 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.1	0.18	0.00	0.05	0.03	0.02	0.02	0.02
0.2	0.37	0.00	0.18	0.12	0.08	0.07	0.06
0.3	0.55	0.00	0.37	0.25	0.18	0.15	0.13
0.4	0.73	0.01	0.64	0.42	0.30	0.26	0.23
0.5	0.92	0.01	0.96	0.64	0.45	0.39	0.34
0.6	1.10	0.02	1.34	0.89	0.64	0.55	0.48
0.7	1.28	0.03	1.79	1.18	0.84	0.73	0.64
0.8	1.47	0.03	2.29	1.51	1.08	0.93	0.81
0.9	1.65	0.04	2.85	1.88	1.34	1.16	1.01
1	1.83	0.05	3.46	2.29	1.63	1.41	1.23
1.1	2.02	0.06	4.12	2.73	1.95	1.68	1.46
1.2	2.20	0.08	4.84	3.21	2.29	1.97	1.72
1.3	2.38	0.09	5.62	3.72	2.65	2.29	2.00
1.4	2.57	0.10	6.44	4.26	3.04	2.62	2.29
1.5	2.75	0.12	7.32	4.84	3.46	2.98	2.60
1.6	2.93	0.13	8.25	5.46	3.90	3.36	2.93
1.7	3.12	0.15	9.23	6.11	4.36	3.76	3.28
1.8	3.30	0.17	10.3	6.79	4.84	4.18	3.64
1.9	3.48	0.19	11.3	7.50	5.35	4.62	4.03
2	3.67	0.21	12.5	8.25	5.89	5.08	4.43
2.1	3.85	0.23	13.6	9.03	6.44	5.56	4.84
2.2	4.03	0.25	14.9	9.84	7.02	6.06	5.28
2.3	4.22	0.28	16.1	10.7	7.62	6.58	5.73
2.4	4.40	0.30	17.5	11.6	8.25	7.11	6.20
2.5	4.58	0.33	18.8	12.5	8.90	7.67	6.69
2.6	4.77	0.35	20.3	13.4	9.57	8.25	7.19
2.7	4.95	0.38	21.7	14.4	10.3	8.85	7.71
2.8	5.13	0.41	23.2	15.4	11.0	9.46	8.25
2.9	5.32	0.44	24.8	16.4	11.7	10.1	8.80
3	5.50	0.47	26.4	17.5	12.5	10.7	9.37
3.1	5.68	0.50	28.0	18.6	13.2	11.4	9.96
3.2	5.87	0.54	29.7	19.7	14.0	12.1	10.6
3.3	6.05	0.57	31.5	20.8	14.9	12.8	11.2
3.4	6.23	0.60	33.3	22.0	15.7	13.5	11.8
3.5	6.42	0.64	35.1	23.2	16.6	14.3	12.5
3.6	6.60	0.68	37.0	24.5	17.5	15.1	13.1
3.7	6.78	0.71	38.9	25.7	18.4	15.8	13.8
3.8	6.97	0.76	40.9	27.0	19.3	16.6	14.5
3.9	7.15	0.80	42.9	28.4	20.3	17.5	15.2
4	7.33	0.84	44.9	29.7	21.2	18.3	16.0
4.1	7.52	0.88	47.0	31.1	22.2	19.2	16.7
4.2	7.70	0.92	49.2	32.5	23.2	20.0	17.5
4.3	7.88	0.97	51.4	34.0	24.3	20.9	18.2
4.4	8.07	1.01	53.6	35.5	25.3	21.8	19.0
4.5	8.25	1.06	55.9	37.0	26.4	22.8	19.8
4.6	8.43	1.10	58.2	38.5	27.5	23.7	20.7
4.7	8.62	1.15	60.6	40.1	28.6	24.7	21.5
4.8	8.80	1.20	63.0	41.7	29.7	25.6	22.4
4.9	8.98	1.25	65.4	43.3	30.9	26.6	23.2
5	9.17	1.31	67.9	44.9	32.1	27.7	24.1



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Flow of Water in Pipes

12 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.26	0.00	0.07	0.05	0.03	0.03	0.03
0.4	0.51	0.00	0.26	0.17	0.12	0.11	0.09
0.6	0.76	0.01	0.55	0.37	0.26	0.23	0.20
0.8	1.02	0.02	0.94	0.62	0.45	0.38	0.34
1	1.27	0.03	1.42	0.94	0.67	0.58	0.51
1.2	1.53	0.04	2.00	1.32	0.94	0.81	0.71
1.4	1.78	0.05	2.65	1.76	1.25	1.08	0.94
1.6	2.04	0.06	3.40	2.25	1.60	1.38	1.21
1.8	2.29	0.08	4.22	2.80	2.00	1.72	1.50
2	2.55	0.10	5.13	3.40	2.42	2.09	1.82
2.2	2.80	0.12	6.12	4.05	2.89	2.49	2.17
2.4	3.06	0.15	7.19	4.76	3.40	2.93	2.55
2.6	3.31	0.17	8.34	5.52	3.94	3.40	2.96
2.8	3.57	0.20	9.57	6.33	4.52	3.90	3.40
3	3.82	0.23	10.9	7.19	5.13	4.43	3.86
3.2	4.07	0.26	12.2	8.11	5.78	4.99	4.35
3.4	4.33	0.29	13.7	9.07	6.47	5.58	4.87
3.6	4.58	0.33	15.2	10.1	7.19	6.20	5.41
3.8	4.84	0.36	16.8	11.1	7.95	6.86	5.98
4	5.09	0.40	18.5	12.2	8.74	7.54	6.57
4.2	5.35	0.45	20.3	13.4	9.57	8.25	7.19
4.4	5.60	0.49	22.1	14.6	10.4	8.99	7.84
4.6	5.86	0.53	24.0	15.9	11.3	9.76	8.51
4.8	6.11	0.58	25.9	17.2	12.2	10.6	9.21
5	6.37	0.63	28.0	18.5	13.2	11.4	9.93
5.2	6.62	0.68	30.1	19.9	14.2	12.2	10.7
5.4	6.88	0.74	32.2	21.3	15.2	13.1	11.5
5.6	7.13	0.79	34.5	22.8	16.3	14.0	12.2
5.8	7.38	0.85	36.8	24.4	17.4	15.0	13.1
6	7.64	0.91	39.2	25.9	18.5	16.0	13.9
6.2	7.89	0.97	41.6	27.6	19.7	17.0	14.8
6.4	8.15	1.03	44.2	29.2	20.9	18.0	15.7
6.6	8.40	1.10	46.7	30.9	22.1	19.0	16.6
6.8	8.66	1.17	49.4	32.7	23.3	20.1	17.5
7	8.91	1.23	52.1	34.5	24.6	21.2	18.5
7.2	9.17	1.31	54.9	36.3	25.9	22.4	19.5
7.4	9.42	1.38	57.8	38.2	27.3	23.5	20.5
7.6	9.68	1.46	60.7	40.2	28.7	24.7	21.5
7.8	9.93	1.53	63.7	42.1	30.1	25.9	22.6
8	10.20	1.62	66.7	44.2	31.5	27.2	23.7
8.2	10.40	1.68	69.8	46.2	33.0	28.4	24.8
8.4	10.70	1.78	73.0	48.3	34.5	29.7	25.9
8.6	10.90	1.85	76.3	50.5	36.0	31.1	27.1
8.8	11.20	1.95	79.6	52.7	37.6	32.4	28.3
9	11.50	2.06	83.0	54.9	39.2	33.8	29.5
9.2	11.70	2.13	86.4	57.2	40.8	35.2	30.7
9.4	12.00	2.24	89.9	59.5	42.5	36.6	31.9
9.6	12.20	2.31	93.5	61.9	44.2	38.1	33.2
9.8	12.50	2.43	97.1	64.3	45.9	39.6	34.5
10	12.70	2.51	101	66.7	47.6	41.1	35.8



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Flow of Water in Pipes

14 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.19	0.00	0.03	0.02	0.02	0.01	0.01
0.4	0.37	0.00	0.12	0.08	0.06	0.05	0.04
0.6	0.56	0.00	0.26	0.17	0.12	0.11	0.09
0.8	0.75	0.01	0.45	0.30	0.21	0.18	0.16
1	0.94	0.01	0.67	0.45	0.32	0.27	0.24
1.2	1.12	0.02	0.94	0.62	0.45	0.38	0.34
1.4	1.31	0.03	1.25	0.83	0.59	0.51	0.45
1.6	1.50	0.04	1.60	1.06	0.76	0.65	0.57
1.8	1.68	0.04	2.00	1.32	0.94	0.81	0.71
2	1.87	0.05	2.42	1.60	1.15	0.99	0.86
2.2	2.06	0.07	2.89	1.91	1.37	1.18	1.03
2.4	2.25	0.08	3.40	2.25	1.60	1.38	1.21
2.6	2.43	0.09	3.94	2.61	1.86	1.60	1.40
2.8	2.62	0.11	4.52	2.99	2.13	1.84	1.60
3	2.81	0.12	5.13	3.40	2.42	2.09	1.82
3.2	2.99	0.14	5.79	3.83	2.73	2.36	2.05
3.4	3.18	0.16	6.47	4.28	3.06	2.64	2.30
3.6	3.37	0.18	7.19	4.76	3.40	2.93	2.55
3.8	3.55	0.20	7.95	5.26	3.76	3.24	2.82
4	3.74	0.22	8.74	5.79	4.13	3.56	3.10
4.2	3.93	0.24	9.57	6.33	4.52	3.90	3.40
4.4	4.12	0.26	10.4	6.90	4.93	4.25	3.70
4.6	4.30	0.29	11.3	7.49	5.35	4.61	4.02
4.8	4.49	0.31	12.2	8.11	5.79	4.99	4.35
5	4.68	0.34	13.2	8.74	6.24	5.38	4.69
5.2	4.86	0.37	14.2	9.40	6.71	5.79	5.04
5.4	5.05	0.40	15.2	10.1	7.19	6.20	5.41
5.6	5.24	0.43	16.3	10.8	7.69	6.64	5.79
5.8	5.43	0.46	17.4	11.5	8.21	7.08	6.17
6	5.61	0.49	18.5	12.2	8.74	7.54	6.57
6.2	5.80	0.52	19.7	13.0	9.29	8.01	6.98
6.4	5.99	0.56	20.9	13.8	9.85	8.49	7.41
6.6	6.17	0.59	22.1	14.6	10.4	8.99	7.84
6.8	6.36	0.63	23.3	15.4	11.0	9.50	8.29
7	6.55	0.67	24.6	16.3	11.6	10.	8.74
7.2	6.74	0.71	25.9	17.2	12.2	10.6	9.21
7.4	6.92	0.74	27.3	18.1	12.9	11.1	9.69
7.6	7.11	0.79	28.7	19.0	13.5	11.7	10.2
7.8	7.30	0.83	30.1	19.9	14.2	12.2	10.7
8	7.48	0.87	31.5	20.9	14.9	12.8	11.2
8.2	7.67	0.91	33.0	21.8	15.6	13.4	11.7
8.4	7.86	0.96	34.5	22.8	16.3	14.0	12.2
8.6	8.04	1.00	36.0	23.8	17.0	14.7	12.8
8.8	8.23	1.05	37.6	24.9	17.8	15.3	13.3
9	8.42	1.10	39.2	25.9	18.5	16.0	13.9
9.2	8.61	1.15	40.8	27.0	19.3	16.6	14.5
9.4	8.79	1.20	42.5	28.1	20.1	17.3	15.1
9.6	8.98	1.25	44.2	29.2	20.9	18.0	15.7
9.8	9.17	1.31	45.9	30.4	21.7	18.7	16.3
10	9.35	1.36	47.6	31.5	22.5	19.4	16.9



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Flow of Water in Pipes

16 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.2	0.14	0.00	0.02	0.01	0.01	0.01	0.01
0.4	0.29	0.00	0.06	0.04	0.03	0.03	0.02
0.6	0.43	0.00	0.14	0.09	0.06	0.06	0.05
0.8	0.57	0.01	0.23	0.15	0.11	0.09	0.08
1	0.72	0.01	0.35	0.23	0.17	0.14	0.13
1.2	0.86	0.01	0.49	0.33	0.23	0.20	0.18
1.4	1.00	0.02	0.66	0.43	0.31	0.27	0.23
1.6	1.15	0.02	0.84	0.56	0.40	0.34	0.30
1.8	1.29	0.03	1.04	0.69	0.49	0.42	0.37
2	1.43	0.03	1.27	0.84	0.60	0.52	0.45
2.2	1.58	0.04	1.51	1.00	0.71	0.62	0.54
2.4	1.72	0.05	1.77	1.17	0.84	0.72	0.63
2.6	1.86	0.05	2.06	1.36	0.97	0.84	0.73
2.8	2.01	0.06	2.36	1.56	1.11	0.96	0.84
3	2.15	0.07	2.68	1.77	1.27	1.09	0.95
3.2	2.29	0.08	3.02	2.00	1.43	1.23	1.07
3.4	2.44	0.09	3.38	2.24	1.60	1.38	1.20
3.6	2.58	0.10	3.76	2.49	1.77	1.53	1.33
3.8	2.72	0.12	4.15	2.75	1.96	1.69	1.47
4	2.86	0.13	4.57	3.02	2.16	1.86	1.62
4.2	3.01	0.14	5.00	3.31	2.36	2.04	1.77
4.4	3.15	0.15	5.45	3.60	2.57	2.22	1.93
4.6	3.29	0.17	5.91	3.91	2.79	2.41	2.10
4.8	3.44	0.18	6.40	4.23	3.02	2.61	2.27
5	3.58	0.20	6.90	4.57	3.26	2.81	2.45
5.2	3.72	0.22	7.42	4.91	3.50	3.02	2.63
5.4	3.87	0.23	7.95	5.26	3.76	3.24	2.82
5.6	4.01	0.25	8.51	5.63	4.02	3.47	3.02
5.8	4.15	0.27	9.08	6.01	4.29	3.70	3.22
6	4.30	0.29	9.67	6.40	4.57	3.94	3.43
6.2	4.44	0.31	10.3	6.80	4.85	4.18	3.65
6.4	4.58	0.33	10.9	7.21	5.14	4.44	3.87
6.6	4.73	0.35	11.5	7.63	5.45	4.70	4.09
6.8	4.87	0.37	12.2	8.06	5.75	4.96	4.33
7	5.01	0.39	12.9	8.51	6.07	5.24	4.57
7.2	5.16	0.41	13.5	8.96	6.40	5.52	4.81
7.4	5.30	0.44	14.2	9.43	6.73	5.80	5.06
7.6	5.44	0.46	15.0	9.91	7.07	6.10	5.32
7.8	5.59	0.49	15.7	10.4	7.42	6.40	5.58
8	5.73	0.51	16.5	10.9	7.77	6.70	5.84
8.2	5.87	0.54	17.2	11.4	8.14	7.02	6.12
8.4	6.02	0.56	18.0	11.9	8.51	7.34	6.40
8.6	6.16	0.59	18.8	12.5	8.89	7.66	6.68
8.8	6.30	0.62	19.6	13.0	9.27	8.00	6.97
9	6.45	0.65	20.5	13.5	9.67	8.34	7.27
9.2	6.59	0.68	21.3	14.1	10.1	8.68	7.57
9.4	6.73	0.70	22.2	14.7	10.5	9.03	7.88
9.6	6.88	0.74	23.1	15.3	10.9	9.39	8.19
9.8	7.02	0.77	24.0	15.9	11.3	9.76	8.51
10	7.16	0.80	24.9	16.5	11.7	10.1	8.83



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Flow of Water in Pipes

18 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.28	0.00	0.05	0.04	0.03	0.02	0.02
1	0.57	0.00	0.20	0.13	0.09	0.08	0.07
1.5	0.85	0.01	0.42	0.28	0.20	0.17	0.15
2	1.13	0.02	0.71	0.47	0.34	0.29	0.25
2.5	1.41	0.03	1.08	0.71	0.51	0.44	0.38
3	1.70	0.04	1.51	1.00	0.71	0.62	0.54
3.5	1.98	0.06	2.01	1.33	0.95	0.82	0.71
4	2.26	0.08	2.57	1.70	1.22	1.05	0.91
4.5	2.55	0.10	3.20	2.12	1.51	1.30	1.14
5	2.83	0.12	3.89	2.57	1.84	1.58	1.38
5.5	3.11	0.15	4.64	3.07	2.19	1.89	1.65
6	3.40	0.18	5.45	3.61	2.57	2.22	1.94
6.5	3.68	0.21	6.32	4.18	2.98	2.57	2.24
7	3.96	0.24	7.25	4.80	3.42	2.95	2.57
7.5	4.24	0.28	8.23	5.45	3.89	3.35	2.92
8	4.53	0.32	9.28	6.14	4.38	3.78	3.29
8.5	4.81	0.36	10.4	6.87	4.90	4.23	3.69
9	5.09	0.40	11.5	7.64	5.45	4.70	4.10
9.5	5.38	0.45	12.8	8.44	6.02	5.19	4.53
10	5.66	0.50	14.0	9.28	6.62	5.71	4.98
10.5	5.94	0.55	15.3	10.2	7.25	6.25	5.45
11	6.22	0.60	16.7	11.1	7.90	6.81	5.94
11.5	6.51	0.66	18.2	12.0	8.58	7.40	6.45
12	6.79	0.72	19.6	13.0	9.28	8.00	6.98
12.5	7.07	0.78	21.2	14.0	10.	8.63	7.52
13	7.36	0.84	22.8	15.1	10.8	9.28	8.09
13.5	7.64	0.91	24.4	16.2	11.5	9.95	8.67
14	7.92	0.98	26.1	17.3	12.3	10.6	9.28
14.5	8.21	1.05	27.9	18.5	13.2	11.4	9.90
15	8.49	1.12	29.7	19.6	14.0	12.1	10.5
15.5	8.77	1.20	31.5	20.9	14.9	12.8	11.2
16	9.05	1.27	33.4	22.1	15.8	13.6	11.9
16.5	9.34	1.36	35.4	23.4	16.7	14.4	12.6
17	9.62	1.44	37.4	24.8	17.7	15.2	13.3
17.5	9.90	1.52	39.5	26.1	18.6	16.1	14.0
18	10.20	1.62	41.6	27.5	19.6	16.9	14.8
18.5	10.50	1.71	43.8	29.0	20.7	17.8	15.5
19	10.80	1.81	46.0	30.4	21.7	18.7	16.3
19.5	11.00	1.88	48.2	31.9	22.8	19.6	17.1
20	11.30	1.98	50.5	33.4	23.9	20.6	17.9
20.5	11.60	2.09	52.9	35.0	25.0	21.5	18.8
21	11.90	2.20	55.3	36.6	26.1	22.5	19.6
21.5	12.20	2.31	57.8	38.2	27.3	23.5	20.5
22	12.40	2.39	60.3	39.9	28.5	24.6	21.4
22.5	12.70	2.51	62.8	41.6	29.7	25.6	22.3
23	13.00	2.63	65.5	43.3	30.9	26.7	23.2
23.5	13.30	2.75	68.1	45.1	32.2	27.7	24.2
24	13.60	2.87	70.8	46.9	33.4	28.8	25.1
24.5	13.90	3.00	73.6	48.7	34.7	30.0	26.1
25	14.10	3.09	76.4	50.5	36.1	31.1	27.1



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Flow of Water in Pipes

20 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.23	0.00	0.03	0.02	0.02	0.01	0.01
1	0.46	0.00	0.12	0.08	0.06	0.05	0.04
1.5	0.69	0.01	0.25	0.17	0.12	0.10	0.09
2	0.92	0.01	0.43	0.28	0.20	0.17	0.15
2.5	1.15	0.02	0.65	0.43	0.31	0.26	0.23
3	1.38	0.03	0.91	0.60	0.43	0.37	0.32
3.5	1.60	0.04	1.20	0.80	0.57	0.49	0.43
4	1.83	0.05	1.54	1.02	0.73	0.63	0.55
4.5	2.06	0.07	1.92	1.27	0.91	0.78	0.68
5	2.29	0.08	2.33	1.54	1.10	0.95	0.83
5.5	2.52	0.10	2.78	1.84	1.31	1.13	0.99
6	2.75	0.12	3.26	2.16	1.54	1.33	1.16
6.5	2.98	0.14	3.78	2.50	1.79	1.54	1.34
7	3.21	0.16	4.34	2.87	2.05	1.77	1.54
7.5	3.44	0.18	4.93	3.26	2.33	2.01	1.75
8	3.67	0.21	5.56	3.68	2.62	2.26	1.97
8.5	3.90	0.24	6.22	4.11	2.94	2.53	2.21
9	4.13	0.27	6.91	4.57	3.26	2.81	2.45
9.5	4.35	0.29	7.64	5.05	3.61	3.11	2.71
10	4.58	0.33	8.40	5.56	3.97	3.42	2.98
10.5	4.81	0.36	9.19	6.08	4.34	3.74	3.26
11	5.04	0.40	10.	6.63	4.73	4.08	3.56
11.5	5.27	0.43	10.9	7.20	5.14	4.43	3.86
12	5.50	0.47	11.8	7.79	5.56	4.79	4.18
12.5	5.73	0.51	12.7	8.40	5.99	5.17	4.51
13	5.96	0.55	13.6	9.03	6.44	5.56	4.85
13.5	6.19	0.60	14.6	9.68	6.91	5.96	5.20
14	6.42	0.64	15.6	10.4	7.39	6.37	5.56
14.5	6.65	0.69	16.7	11.1	7.89	6.80	5.93
15	6.88	0.74	17.8	11.8	8.40	7.24	6.31
15.5	7.10	0.78	18.9	12.5	8.92	7.69	6.71
16	7.33	0.84	20.0	13.3	9.46	8.16	7.11
16.5	7.56	0.89	21.2	14.0	10.	8.64	7.53
17	7.79	0.94	22.4	14.8	10.6	9.13	7.96
17.5	8.02	1.00	23.6	15.6	11.2	9.63	8.40
18	8.25	1.06	24.9	16.5	11.8	10.1	8.85
18.5	8.48	1.12	26.2	17.3	12.4	10.7	9.31
19	8.71	1.18	27.5	18.2	13.0	11.2	9.78
19.5	8.94	1.24	28.9	19.1	13.6	11.8	10.3
20	9.17	1.31	30.3	20.0	14.3	12.3	10.7
20.5	9.40	1.37	31.7	21.0	15.0	12.9	11.3
21	9.63	1.44	33.1	21.9	15.6	13.5	11.8
21.5	9.85	1.51	34.6	22.9	16.3	14.1	12.3
22	10.10	1.59	36.1	23.9	17.1	14.7	12.8
22.5	10.30	1.65	37.6	24.9	17.8	15.3	13.4
23	10.50	1.71	39.2	25.9	18.5	16.0	13.9
23.5	10.80	1.81	40.8	27.0	19.3	16.6	14.5
24	11.00	1.88	42.4	28.1	20.0	17.3	15.1
24.5	11.20	1.95	44.1	29.2	20.8	17.9	15.6
25	11.50	2.06	45.7	30.3	21.6	18.6	16.2



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Flow of Water in Pipes

24 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
0.5	0.16	0.00	0.01	0.01	0.01	0.01	0.00
1	0.32	0.00	0.05	0.03	0.02	0.02	0.02
1.5	0.48	0.00	0.10	0.07	0.05	0.04	0.04
2	0.64	0.01	0.18	0.12	0.08	0.07	0.06
2.5	0.80	0.01	0.27	0.18	0.13	0.11	0.09
3	0.96	0.01	0.37	0.25	0.18	0.15	0.13
3.5	1.11	0.02	0.50	0.33	0.23	0.20	0.18
4	1.27	0.03	0.64	0.42	0.30	0.26	0.23
4.5	1.43	0.03	0.79	0.52	0.37	0.32	0.28
5	1.59	0.04	0.96	0.64	0.45	0.39	0.34
5.5	1.75	0.05	1.14	0.76	0.54	0.47	0.41
6	1.91	0.06	1.34	0.89	0.64	0.55	0.48
6.5	2.07	0.07	1.56	1.03	0.74	0.64	0.55
7	2.23	0.08	1.79	1.18	0.84	0.73	0.64
7.5	2.39	0.09	2.03	1.34	0.96	0.83	0.72
8	2.55	0.10	2.29	1.51	1.08	0.93	0.81
8.5	2.71	0.11	2.56	1.69	1.21	1.04	0.91
9	2.86	0.13	2.85	1.88	1.34	1.16	1.01
9.5	3.02	0.14	3.15	2.08	1.49	1.28	1.12
10	3.18	0.16	3.46	2.29	1.63	1.41	1.23
10.5	3.34	0.17	3.78	2.50	1.79	1.54	1.34
11	3.50	0.19	4.13	2.73	1.95	1.68	1.46
11.5	3.66	0.21	4.48	2.96	2.12	1.82	1.59
12	3.82	0.23	4.85	3.21	2.29	1.97	1.72
12.5	3.98	0.25	5.23	3.46	2.47	2.13	1.86
13	4.14	0.27	5.62	3.72	2.65	2.29	2.00
13.5	4.30	0.29	6.03	3.99	2.85	2.45	2.14
14	4.46	0.31	6.44	4.26	3.04	2.62	2.29
14.5	4.62	0.33	6.88	4.55	3.25	2.80	2.44
15	4.77	0.35	7.32	4.85	3.46	2.98	2.60
15.5	4.93	0.38	7.78	5.15	3.67	3.17	2.76
16	5.09	0.40	8.25	5.46	3.90	3.36	2.93
16.5	5.25	0.43	8.73	5.78	4.13	3.56	3.10
17	5.41	0.46	9.23	6.11	4.36	3.76	3.28
17.5	5.57	0.48	9.74	6.44	4.60	3.97	3.46
18	5.73	0.51	10.3	6.79	4.85	4.18	3.64
18.5	5.89	0.54	10.8	7.14	5.10	4.40	3.83
19	6.05	0.57	11.3	7.50	5.36	4.62	4.03
19.5	6.21	0.60	11.9	7.87	5.62	4.85	4.22
20	6.37	0.63	12.5	8.25	5.89	5.08	4.43
20.5	6.53	0.66	13.0	8.64	6.16	5.32	4.63
21	6.68	0.69	13.6	9.03	6.44	5.56	4.85
21.5	6.84	0.73	14.3	9.43	6.73	5.80	5.06
22	7.00	0.76	14.9	9.84	7.02	6.06	5.28
22.5	7.16	0.80	15.5	10.3	7.32	6.31	5.51
23	7.32	0.83	16.1	10.7	7.63	6.58	5.73
23.5	7.48	0.87	16.8	11.1	7.94	6.84	5.97
24	7.64	0.91	17.5	11.6	8.25	7.12	6.20
24.5	7.80	0.95	18.1	12.0	8.57	7.39	6.44
25	7.96	0.99	18.8	12.5	8.90	7.67	6.69



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Flow of Water in Pipes

30 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
1	0.20	0.00	0.02	0.01	0.01	0.01	0.01
2	0.41	0.00	0.06	0.04	0.03	0.02	0.02
3	0.61	0.01	0.13	0.08	0.06	0.05	0.04
4	0.82	0.01	0.21	0.14	0.10	0.09	0.08
5	1.02	0.02	0.32	0.21	0.15	0.13	0.12
6	1.22	0.02	0.45	0.30	0.21	0.19	0.16
7	1.43	0.03	0.60	0.40	0.29	0.25	0.21
8	1.63	0.04	0.77	0.51	0.37	0.32	0.27
9	1.83	0.05	0.96	0.64	0.45	0.39	0.34
10	2.04	0.06	1.17	0.77	0.55	0.48	0.42
11	2.24	0.08	1.39	0.92	0.66	0.57	0.50
12	2.44	0.09	1.64	1.08	0.77	0.67	0.58
13	2.65	0.11	1.90	1.26	0.90	0.77	0.67
14	2.85	0.13	2.18	1.44	1.03	0.89	0.77
15	3.06	0.15	2.47	1.64	1.17	1.01	0.88
16	3.26	0.17	2.79	1.84	1.32	1.13	0.99
17	3.46	0.19	3.12	2.06	1.47	1.27	1.11
18	3.67	0.21	3.46	2.29	1.64	1.41	1.23
19	3.87	0.23	3.83	2.53	1.81	1.56	1.36
20	4.07	0.26	4.21	2.79	1.99	1.71	1.49
21	4.28	0.29	4.61	3.05	2.18	1.88	1.64
22	4.48	0.31	5.02	3.32	2.37	2.05	1.78
23	4.69	0.34	5.45	3.61	2.57	2.22	1.94
24	4.89	0.37	5.90	3.90	2.79	2.40	2.09
25	5.09	0.40	6.36	4.21	3.00	2.59	2.26
26	5.30	0.44	6.84	4.53	3.23	2.79	2.43
27	5.50	0.47	7.33	4.85	3.46	2.99	2.60
28	5.70	0.51	7.84	5.19	3.71	3.20	2.79
29	5.91	0.54	8.37	5.54	3.95	3.41	2.97
30	6.11	0.58	8.91	5.90	4.21	3.63	3.17
31	6.32	0.62	9.47	6.27	4.47	3.86	3.36
32	6.52	0.66	10.	6.65	4.74	4.09	3.57
33	6.72	0.70	10.6	7.04	5.02	4.33	3.78
34	6.93	0.75	11.2	7.44	5.31	4.58	3.99
35	7.13	0.79	11.9	7.84	5.60	4.83	4.21
36	7.33	0.84	12.5	8.26	5.90	5.09	4.43
37	7.54	0.88	13.1	8.69	6.21	5.35	4.67
38	7.74	0.93	13.8	9.13	6.52	5.62	4.90
39	7.95	0.98	14.5	9.58	6.84	5.90	5.14
40	8.15	1.03	15.2	10.	7.17	6.18	5.39
41	8.35	1.08	15.9	10.5	7.50	6.47	5.64
42	8.56	1.14	16.6	11.0	7.84	6.77	5.90
43	8.76	1.19	17.3	11.5	8.19	7.07	6.16
44	8.96	1.25	18.1	12.0	8.55	7.37	6.43
45	9.17	1.31	18.9	12.5	8.91	7.69	6.70
46	9.37	1.36	19.7	13.0	9.28	8.01	6.98
47	9.57	1.42	20.5	13.5	9.66	8.33	7.26
48	9.78	1.49	21.3	14.1	10.	8.66	7.55
49	9.98	1.55	22.1	14.6	10.4	9.00	7.84
50	10.20	1.62	22.9	15.2	10.8	9.34	8.14



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Flow of Water in Pipes

36 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.28	0.00	0.02	0.02	0.01	0.01	0.01
4	0.57	0.00	0.09	0.06	0.04	0.04	0.03
6	0.85	0.01	0.19	0.12	0.09	0.08	0.07
8	1.13	0.02	0.32	0.21	0.15	0.13	0.11
10	1.41	0.03	0.48	0.32	0.23	0.20	0.17
12	1.70	0.04	0.67	0.45	0.32	0.27	0.24
14	1.98	0.06	0.90	0.59	0.42	0.37	0.32
16	2.26	0.08	1.15	0.76	0.54	0.47	0.41
18	2.55	0.10	1.43	0.94	0.67	0.58	0.51
20	2.83	0.12	1.73	1.15	0.82	0.71	0.62
22	3.11	0.15	2.07	1.37	0.98	0.84	0.73
24	3.40	0.18	2.43	1.61	1.15	0.99	0.86
26	3.68	0.21	2.82	1.86	1.33	1.15	1.00
28	3.96	0.24	3.23	2.14	1.53	1.32	1.15
30	4.24	0.28	3.67	2.43	1.73	1.50	1.30
32	4.53	0.32	4.14	2.74	1.95	1.68	1.47
34	4.81	0.36	4.63	3.06	2.19	1.88	1.64
36	5.09	0.40	5.14	3.40	2.43	2.09	1.83
38	5.38	0.45	5.68	3.76	2.68	2.32	2.02
40	5.66	0.50	6.25	4.14	2.95	2.55	2.22
42	5.94	0.55	6.84	4.53	3.23	2.79	2.43
44	6.22	0.60	7.46	4.93	3.52	3.04	2.65
46	6.51	0.66	8.09	5.36	3.82	3.30	2.87
48	6.79	0.72	8.76	5.80	4.14	3.57	3.11
50	7.07	0.78	9.44	6.25	4.46	3.85	3.35
52	7.36	0.84	10.2	6.72	4.80	4.14	3.61
54	7.64	0.91	10.9	7.21	5.14	4.44	3.87
56	7.92	0.98	11.6	7.71	5.50	4.74	4.14
58	8.21	1.05	12.4	8.23	5.87	5.06	4.41
60	8.49	1.12	13.2	8.76	6.25	5.39	4.70
62	8.77	1.20	14.1	9.31	6.64	5.73	4.99
64	9.05	1.27	14.9	9.87	7.04	6.07	5.30
66	9.34	1.36	15.8	10.4	7.46	6.43	5.61
68	9.62	1.44	16.7	11.0	7.88	6.79	5.92
70	9.90	1.52	17.6	11.6	8.31	7.17	6.25
72	10.20	1.62	18.5	12.3	8.76	7.55	6.58
74	10.50	1.71	19.5	12.9	9.21	7.94	6.93
76	10.80	1.81	20.5	13.6	9.68	8.35	7.28
78	11.00	1.88	21.5	14.2	10.2	8.76	7.64
80	11.30	1.98	22.5	14.9	10.6	9.18	8.00
82	11.60	2.09	23.6	15.6	11.1	9.61	8.38
84	11.90	2.20	24.7	16.3	11.6	10.	8.76
86	12.20	2.31	25.8	17.0	12.2	10.5	9.15
88	12.40	2.39	26.9	17.8	12.7	10.9	9.54
90	12.70	2.51	28.0	18.5	13.2	11.4	9.95
92	13.00	2.63	29.2	19.3	13.8	11.9	10.4
94	13.30	2.75	30.4	20.1	14.3	12.4	10.8
96	13.60	2.87	31.6	20.9	14.9	12.9	11.2
98	13.90	3.00	32.8	21.7	15.5	13.4	11.6
100	14.10	3.09	34.0	22.5	16.1	13.9	12.1



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Flow of Water in Pipes

42 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2	0.21	0.00	0.01	0.01	0.01	0.00	0.00
4	0.42	0.00	0.04	0.03	0.02	0.02	0.01
6	0.62	0.01	0.09	0.06	0.04	0.04	0.03
8	0.83	0.01	0.15	0.10	0.07	0.06	0.05
10	1.04	0.02	0.23	0.15	0.11	0.09	0.08
12	1.25	0.02	0.32	0.21	0.15	0.13	0.11
14	1.46	0.03	0.42	0.28	0.20	0.17	0.15
16	1.66	0.04	0.54	0.36	0.26	0.22	0.19
18	1.87	0.05	0.67	0.45	0.32	0.27	0.24
20	2.08	0.07	0.82	0.54	0.39	0.33	0.29
22	2.29	0.08	0.98	0.65	0.46	0.40	0.35
24	2.49	0.10	1.15	0.76	0.54	0.47	0.41
26	2.70	0.11	1.33	0.88	0.63	0.54	0.47
28	2.91	0.13	1.53	1.01	0.72	0.62	0.54
30	3.12	0.15	1.73	1.15	0.82	0.71	0.62
32	3.33	0.17	1.95	1.29	0.92	0.80	0.69
34	3.53	0.19	2.19	1.45	1.03	0.89	0.78
36	3.74	0.22	2.43	1.61	1.15	0.99	0.86
38	3.95	0.24	2.69	1.78	1.27	1.09	0.95
40	4.16	0.27	2.95	1.95	1.39	1.20	1.05
42	4.37	0.30	3.23	2.14	1.53	1.32	1.15
44	4.57	0.33	3.52	2.33	1.66	1.43	1.25
46	4.78	0.36	3.82	2.53	1.81	1.56	1.36
48	4.99	0.39	4.14	2.74	1.95	1.68	1.47
50	5.20	0.42	4.46	2.95	2.11	1.82	1.58
52	5.40	0.45	4.80	3.17	2.27	1.95	1.70
54	5.61	0.49	5.14	3.40	2.43	2.10	1.83
56	5.82	0.53	5.50	3.64	2.60	2.24	1.95
58	6.03	0.57	5.87	3.89	2.77	2.39	2.08
60	6.24	0.61	6.25	4.14	2.95	2.55	2.22
62	6.44	0.65	6.64	4.40	3.14	2.71	2.36
64	6.65	0.69	7.04	4.66	3.33	2.87	2.50
66	6.86	0.73	7.46	4.93	3.52	3.04	2.65
68	7.07	0.78	7.88	5.21	3.72	3.21	2.80
70	7.28	0.82	8.31	5.50	3.93	3.39	2.95
72	7.48	0.87	8.76	5.80	4.14	3.57	3.11
74	7.69	0.92	9.21	6.10	4.35	3.75	3.27
76	7.90	0.97	9.68	6.41	4.57	3.94	3.44
78	8.11	1.02	10.2	6.72	4.80	4.14	3.61
80	8.32	1.08	10.6	7.04	5.03	4.34	3.78
82	8.52	1.13	11.1	7.37	5.26	4.54	3.96
84	8.73	1.18	11.6	7.71	5.50	4.74	4.14
86	8.94	1.24	12.2	8.05	5.75	4.96	4.32
88	9.15	1.30	12.7	8.40	6.00	5.17	4.51
90	9.35	1.36	13.2	8.76	6.25	5.39	4.70
92	9.56	1.42	13.8	9.12	6.51	5.61	4.89
94	9.77	1.48	14.3	9.49	6.77	5.84	5.09
96	9.98	1.55	14.9	9.87	7.04	6.07	5.30
98	10.20	1.62	15.5	10.3	7.32	6.31	5.50
100	10.40	1.68	16.1	10.6	7.60	6.55	5.71



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Flow of Water in Pipes

48 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
2.5	0.20	0.00	0.01	0.01	0.00	0.00	0.00
5	0.40	0.00	0.03	0.02	0.02	0.01	0.01
7.5	0.60	0.01	0.07	0.05	0.03	0.03	0.02
10	0.80	0.01	0.12	0.08	0.06	0.05	0.04
12.5	1.00	0.02	0.18	0.12	0.08	0.07	0.06
15	1.19	0.02	0.25	0.17	0.12	0.10	0.09
17.5	1.39	0.03	0.33	0.22	0.16	0.14	0.12
20	1.59	0.04	0.43	0.28	0.20	0.17	0.15
22.5	1.79	0.05	0.53	0.35	0.25	0.22	0.19
25	1.99	0.06	0.65	0.43	0.31	0.26	0.23
27.5	2.19	0.07	0.77	0.51	0.36	0.31	0.27
30	2.39	0.09	0.91	0.60	0.43	0.37	0.32
32.5	2.59	0.10	1.05	0.70	0.50	0.43	0.37
35	2.79	0.12	1.20	0.80	0.57	0.49	0.43
37.5	2.98	0.14	1.37	0.91	0.65	0.56	0.49
40	3.18	0.16	1.54	1.02	0.73	0.63	0.55
42.5	3.38	0.18	1.72	1.14	0.82	0.70	0.61
45	3.58	0.20	1.92	1.27	0.91	0.78	0.68
47.5	3.78	0.22	2.12	1.40	1.00	0.86	0.75
50	3.98	0.25	2.33	1.54	1.10	0.95	0.83
52.5	4.18	0.27	2.55	1.69	1.20	1.04	0.91
55	4.38	0.30	2.78	1.84	1.31	1.13	0.99
57.5	4.58	0.33	3.02	2.00	1.43	1.23	1.07
60	4.77	0.35	3.26	2.16	1.54	1.33	1.16
62.5	4.97	0.38	3.52	2.33	1.66	1.43	1.25
65	5.17	0.42	3.79	2.51	1.79	1.54	1.34
67.5	5.37	0.45	4.06	2.69	1.92	1.65	1.44
70	5.57	0.48	4.34	2.87	2.05	1.77	1.54
72.5	5.77	0.52	4.63	3.07	2.19	1.89	1.65
75	5.97	0.55	4.93	3.26	2.33	2.01	1.75
77.5	6.17	0.59	5.24	3.47	2.48	2.13	1.86
80	6.37	0.63	5.56	3.68	2.63	2.26	1.97
82.5	6.57	0.67	5.88	3.89	2.78	2.40	2.09
85	6.76	0.71	6.22	4.11	2.94	2.53	2.21
87.5	6.96	0.75	6.56	4.34	3.10	2.67	2.33
90	7.16	0.80	6.91	4.57	3.26	2.81	2.45
92.5	7.36	0.84	7.27	4.81	3.43	2.96	2.58
95	7.56	0.89	7.64	5.05	3.61	3.11	2.71
97.5	7.76	0.94	8.01	5.30	3.79	3.26	2.85
100	7.96	0.99	8.40	5.56	3.97	3.42	2.98
102.5	8.16	1.03	8.79	5.82	4.15	3.58	3.12
105	8.36	1.09	9.19	6.08	4.34	3.74	3.26
107.5	8.55	1.14	9.60	6.35	4.53	3.91	3.41
110	8.75	1.19	10.	6.63	4.73	4.08	3.56
112.5	8.95	1.24	10.4	6.91	4.93	4.25	3.71
115	9.15	1.30	10.9	7.20	5.14	4.43	3.86
117.5	9.35	1.36	11.3	7.49	5.35	4.61	4.02
120	9.55	1.42	11.8	7.79	5.56	4.79	4.18
122.5	9.75	1.48	12.2	8.09	5.77	4.98	4.34
125	9.95	1.54	12.7	8.40	5.99	5.17	4.51



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Flow of Water in Pipes

54 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
5	0.31	0.00	0.02	0.01	0.01	0.01	0.01
10	0.63	0.01	0.07	0.04	0.03	0.03	0.02
15	0.94	0.01	0.14	0.09	0.07	0.06	0.05
20	1.26	0.02	0.24	0.16	0.11	0.10	0.09
25	1.57	0.04	0.36	0.24	0.17	0.15	0.13
30	1.89	0.06	0.51	0.34	0.24	0.21	0.18
35	2.20	0.08	0.68	0.45	0.32	0.28	0.24
40	2.52	0.10	0.87	0.58	0.41	0.35	0.31
45	2.83	0.12	1.08	0.72	0.51	0.44	0.38
50	3.14	0.15	1.31	0.87	0.62	0.54	0.47
55	3.46	0.19	1.57	1.04	0.74	0.64	0.56
60	3.77	0.22	1.84	1.22	0.87	0.75	0.65
65	4.09	0.26	2.13	1.41	1.01	0.87	0.76
70	4.40	0.30	2.45	1.62	1.16	1.00	0.87
75	4.72	0.35	2.78	1.84	1.31	1.13	0.99
80	5.03	0.39	3.13	2.07	1.48	1.28	1.11
85	5.34	0.44	3.51	2.32	1.66	1.43	1.24
90	5.66	0.50	3.90	2.58	1.84	1.59	1.38
95	5.97	0.55	4.31	2.85	2.03	1.75	1.53
100	6.29	0.62	4.73	3.13	2.24	1.93	1.68
105	6.60	0.68	5.18	3.43	2.45	2.11	1.84
110	6.92	0.74	5.65	3.74	2.67	2.30	2.01
115	7.23	0.81	6.13	4.06	2.90	2.50	2.18
120	7.55	0.89	6.63	4.39	3.13	2.70	2.36
125	7.86	0.96	7.15	4.73	3.38	2.91	2.54
130	8.17	1.04	7.69	5.09	3.63	3.13	2.73
135	8.49	1.12	8.25	5.46	3.90	3.36	2.93
140	8.80	1.20	8.82	5.84	4.17	3.59	3.13
145	9.12	1.29	9.42	6.23	4.45	3.84	3.34
150	9.43	1.38	10.	6.63	4.73	4.08	3.56
155	9.75	1.48	10.7	7.05	5.03	4.34	3.78
160	10.10	1.59	11.3	7.48	5.34	4.60	4.01
165	10.40	1.68	12.0	7.91	5.65	4.87	4.25
170	10.70	1.78	12.6	8.36	5.97	5.15	4.49
175	11.00	1.88	13.3	8.82	6.30	5.43	4.73
180	11.30	1.98	14.0	9.30	6.63	5.72	4.99
185	11.60	2.09	14.8	9.78	6.98	6.02	5.25
190	11.90	2.20	15.5	10.3	7.33	6.32	5.51
195	12.30	2.35	16.3	10.8	7.69	6.63	5.78
200	12.60	2.47	17.1	11.3	8.06	6.95	6.06
205	12.90	2.59	17.9	11.8	8.44	7.28	6.35
210	13.20	2.71	18.7	12.4	8.82	7.61	6.63
215	13.50	2.83	19.5	12.9	9.22	7.95	6.93
220	13.80	2.96	20.4	13.5	9.62	8.29	7.23
225	14.10	3.09	21.2	14.0	10.	8.65	7.54
230	14.50	3.27	22.1	14.6	10.4	9.00	7.85
235	14.80	3.40	23.0	15.2	10.9	9.37	8.17
240	15.10	3.54	23.9	15.8	11.3	9.74	8.49
245	15.40	3.69	24.8	16.4	11.7	10.1	8.82
250	15.70	3.83	25.8	17.1	12.2	10.5	9.16



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Flow of Water in Pipes

60 Inch Diameter Pipe							
Flow CFS	Velocity (ft/sec)	Vel. Head (ft)	Headloss in Feet per 1,000 Feet, for C=				
			80	100	120	130	140
5	0.26	0.00	0.01	0.01	0.01	0.00	0.00
10	0.51	0.00	0.04	0.03	0.02	0.02	0.01
15	0.76	0.01	0.08	0.06	0.04	0.03	0.03
20	1.02	0.02	0.14	0.10	0.07	0.06	0.05
25	1.27	0.03	0.22	0.14	0.10	0.09	0.08
30	1.53	0.04	0.31	0.20	0.14	0.13	0.11
35	1.78	0.05	0.41	0.27	0.19	0.17	0.14
40	2.04	0.06	0.52	0.35	0.25	0.21	0.19
45	2.29	0.08	0.65	0.43	0.31	0.26	0.23
50	2.55	0.10	0.79	0.52	0.37	0.32	0.28
55	2.80	0.12	0.94	0.62	0.44	0.38	0.33
60	3.06	0.15	1.10	0.73	0.52	0.45	0.39
65	3.31	0.17	1.28	0.85	0.60	0.52	0.45
70	3.57	0.20	1.47	0.97	0.69	0.60	0.52
75	3.82	0.23	1.67	1.10	0.79	0.68	0.59
80	4.07	0.26	1.88	1.24	0.89	0.76	0.67
85	4.33	0.29	2.10	1.39	0.99	0.86	0.75
90	4.58	0.33	2.33	1.54	1.10	0.95	0.83
95	4.84	0.36	2.58	1.71	1.22	1.05	0.92
100	5.09	0.40	2.84	1.88	1.34	1.16	1.01
105	5.35	0.45	3.10	2.05	1.47	1.26	1.10
110	5.60	0.49	3.38	2.24	1.60	1.38	1.20
115	5.86	0.53	3.67	2.43	1.73	1.50	1.30
120	6.11	0.58	3.97	2.63	1.88	1.62	1.41
125	6.37	0.63	4.29	2.84	2.02	1.75	1.52
130	6.62	0.68	4.61	3.05	2.18	1.88	1.64
135	6.88	0.74	4.94	3.27	2.33	2.01	1.75
140	7.13	0.79	5.28	3.50	2.50	2.15	1.88
145	7.38	0.85	5.64	3.73	2.66	2.30	2.00
150	7.64	0.91	6.00	3.97	2.84	2.45	2.13
155	7.89	0.97	6.38	4.22	3.01	2.60	2.27
160	8.15	1.03	6.77	4.48	3.20	2.76	2.40
165	8.40	1.10	7.16	4.74	3.38	2.92	2.54
170	8.66	1.17	7.57	5.01	3.57	3.08	2.69
175	8.91	1.23	7.99	5.28	3.77	3.25	2.84
180	9.17	1.31	8.41	5.57	3.97	3.43	2.99
185	9.42	1.38	8.85	5.86	4.18	3.60	3.14
190	9.68	1.46	9.30	6.15	4.39	3.79	3.30
195	9.93	1.53	9.76	6.46	4.61	3.97	3.46
200	10.20	1.62	10.2	6.77	4.83	4.16	3.63
205	10.40	1.68	10.7	7.08	5.05	4.36	3.80
210	10.70	1.78	11.2	7.40	5.28	4.56	3.97
215	10.90	1.85	11.7	7.73	5.52	4.76	4.15
220	11.20	1.95	12.2	8.07	5.76	4.97	4.33
225	11.50	2.06	12.7	8.41	6.00	5.18	4.51
230	11.70	2.13	13.2	8.76	6.25	5.39	4.70
235	12.00	2.24	13.8	9.12	6.51	5.61	4.89
240	12.20	2.31	14.3	9.48	6.77	5.83	5.09
245	12.50	2.43	14.9	9.85	7.03	6.06	5.28
250	12.70	2.51	15.4	10.2	7.30	6.29	5.49



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